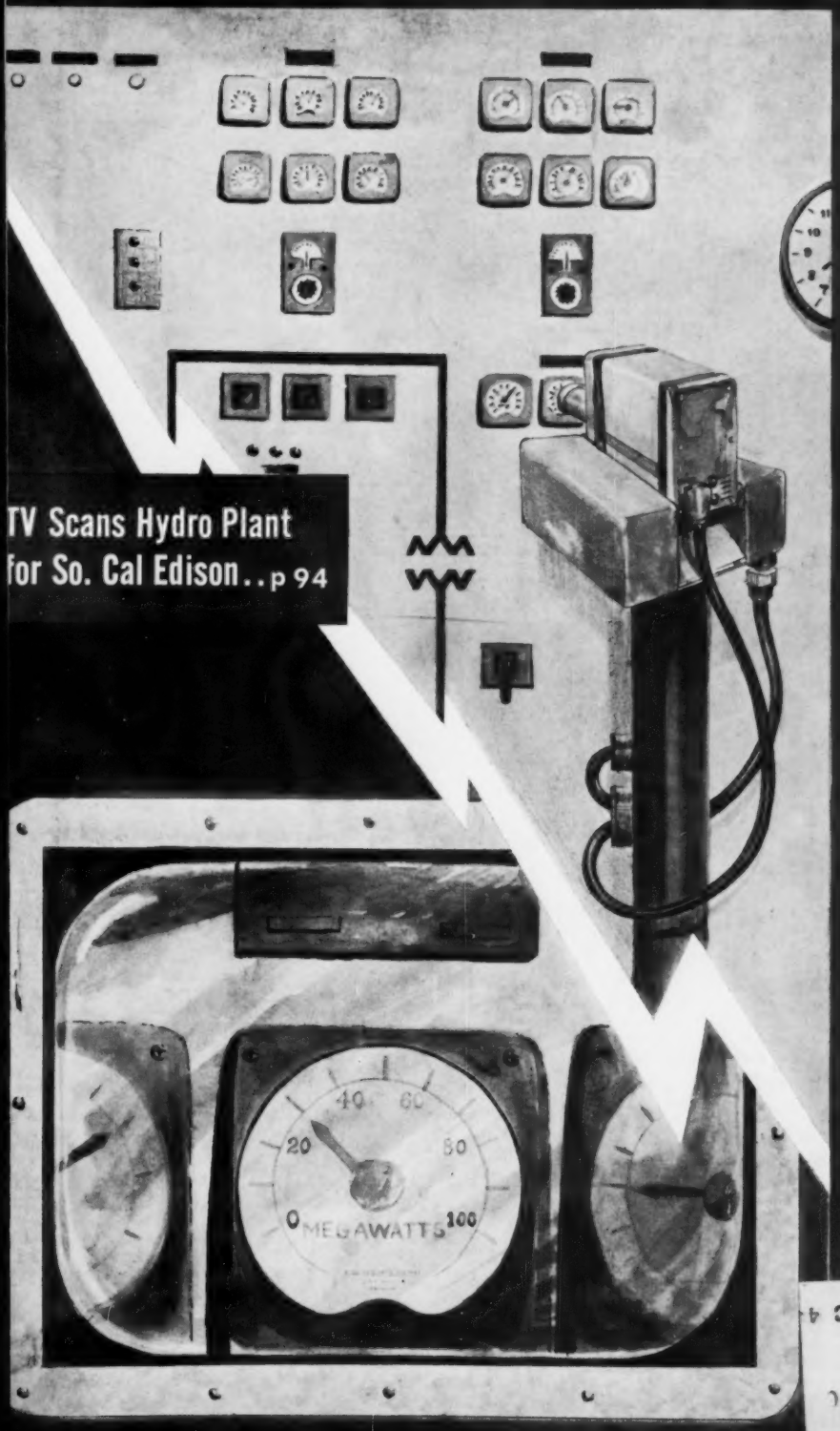
Electrical World

Fourth of six reports for 1960



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- Detroit Edison Proves-out Procedure for Quick Start-up of Turbines

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UNIV MICROFILMS INC
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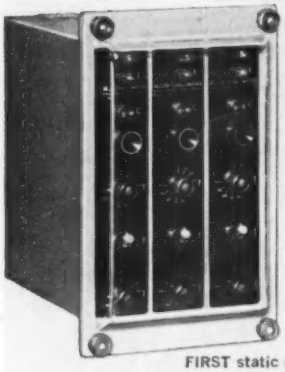
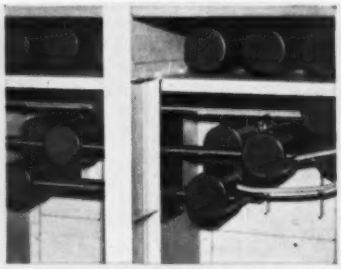
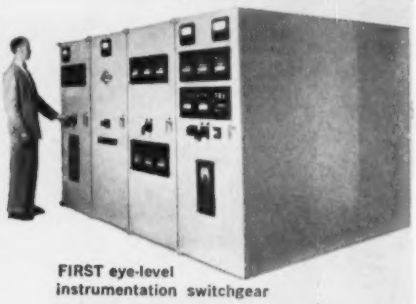
ALLIS-CHALMERS



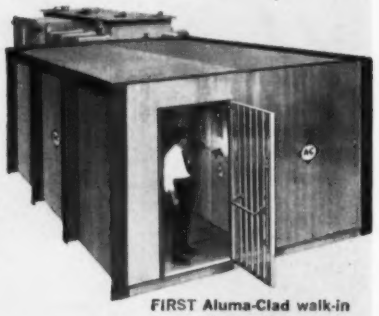
FIRST static overcurrent relays



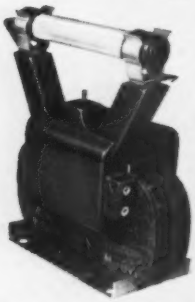
FIRST with track-resistant, glass polyester insulation with primary stud and bus joint



FIRST eye-level instrumentation switchgear

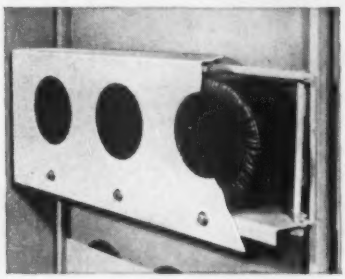


FIRST Aluma-Clad walk-in aisle switchgear



FIRST epoxy-resin potential transformers, trunnion mounted

FIRST front-access current transformers



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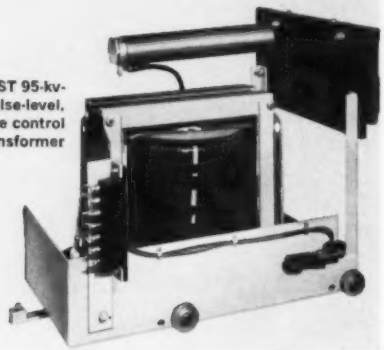


FIRST 95-kv-impulse-level, dry-type control power transformer

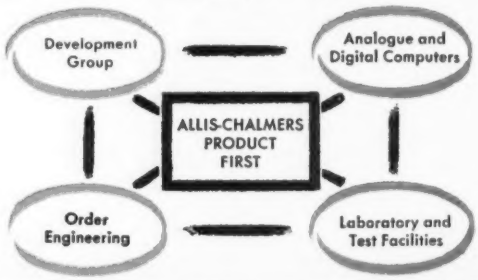
...from the company that put

Progress in Switchgear

For 113 years Allis-Chalmers has built a reputation for the finest products in the industry. A-C is continuously developing new ideas, new techniques and new products to serve you better. This same leadership spirit has quickened the pace of switchgear progress. It's responsible for the firsts illustrated above. These testify to one company's research and engineering *action*.

There are still better things to come in switchgear. You'll get them all when you specify better switchgear ... designed, built and *guaranteed* by **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin. A-1357

Aluma-Clad is an Allis-Chalmers trademark.



Intradepartment teamwork bridges all gaps ... smoothly integrates information, machines and men ... speeding overall progress in Allis-Chalmers switchgear.

Electrical World

Vol. 154, No. 9 AUGUST 29, 1960

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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Partial details on sites and expenditures are given in report for Kerr Committee on water resources.....p 50

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New Loading Plan Seen Saving $10 Million

O. L. Hill, Pacific Gas & Electric Co

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High-Voltage Cables Used Down Under

Australian 330-kv oil-filled cables carry underground generators' output to overhead lines.....p 60

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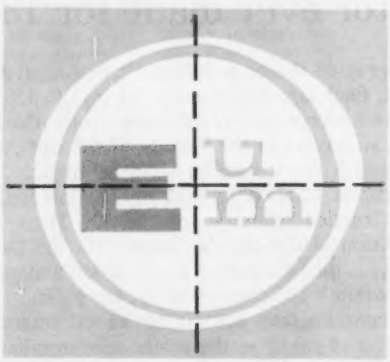

Electric Utility Methods

New devices for better performance, plus new uses for proven tools and equipment, are presented in the fourth of six reports in 1960 for those working in utility construction, operation or maintenance. Almost a score of methods are detailed in this 70-page report.

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LONG LIFE AHEAD—Here a 1,000-foot run of the record Okonite cable is being pulled into a manhole on Los Angeles' Imperial Highway from a Department of Water and Power cable trailer. The loaded reel weighed 15 tons.

Cable'bility at work

Los Angeles installs oil-filled Okonite cable with largest conductor ever made for 138 kv

Cable'bility (cā'ble·bil'·i·ty) *new word. Noun.* **1.** Ability to design and manufacture electrical cables that give outstanding performance. **2.** Having long background and wide experience in cable research and application. **3.** Possessing keen understanding of customers' problems. Implies eagerness to serve faithfully and dedication to progress. **Syn.** The Okonite Company.

It's a giant, this Okonite cable. Its single conductor is the largest ever made for 138 kv.

Installed in parallel underground circuits—each seven and three-quarter miles long—these low-pressure, oil-filled cables carry power generated by Los Angeles Department of Water and Power's new Scattergood Steam Plant. Each circuit can carry 231 mva at 138 kv.

The underground installation avoids the use of overhead structures in the vicinity of the Los Angeles International Airport, with its heavy air traffic.

Okonite Cable'bility was on the job long before the cable carried Scattergood's power. There was the cooperation in the cable's design with the DOWAP engineers . . . the painstaking construction and quality control at Okonite's Paterson plant . . . the careful cross-country shipment on reels containing an oil reservoir for each 333 feet of cable . . . the on-the-spot installation aid.

Most important, there was Okonite's 80-year background in designing and producing long-lived cables for other critical jobs.

Why not put Okonite Cable'bility to work on *your* next job? The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

***where there's electrical power . . . there's* OKONITE CABLE**

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LETTERS

Clarification of CEA Elections

To the Editor:

With respect to your editorial comment in your issue of Aug. 8 referring to the newly elected top officers of . . . (Canadian Electrical) Assn and also the article in the same issue entitled "Provincial Execs Win Top Posts," I should like to point out to you that although you were quite right in announcing that CEA's president and vice president are from the publicly-operated power corporate members of this association, I would like to explain that our constitution states that "the office of president shall be held in alternate years by a representative from investor-owned corporation members and from provincial government commission members. One vice president shall be a representative from investor-owned corporation members and one shall be a representative from provincial government commission members."

From this you will see that next year our president and a vice president will be from the investor-owned utilities, with a vice president from the publicly-operated commissions.

From the above I would hardly say that this event is a "take-over" of an important association. As a matter of fact, on the board of directors equal representation is found from the investor-owned utilities, the provincial power commissions and manufacturers, of which each group has six members on the board of directors.

B. C. Fairchild
General Manager, CEA
Montreal, Quebec

▶ *Thanks for detailing the arrangement. We might well have included it in the CEA article. May we gently remind Mr Fairchild that the editorial comment stated that the "easy evaluation" of this event as a "take-over" availed us little. Perhaps we should have stated the point more plainly: We don't think anyone* should *regard it as a take-over.*

Requesting Reprints

To the Editor:

. . . I would appreciate knowing your policy regarding reprinting of your material . . .

James E. Fort
Louisiana Power & Light Co
New Orleans, La.

▶ *We often receive requests for reprints of articles we have published. In general, we are delighted to give permission for you to reprint articles. Copyright restrictions require requests to be in writing, addressed to The Editor. Or we would be pleased to quote quantity prices if you want us to supply the reprints.*

Circuit Breaker Protection at Half the Price

PR Recloser with Circuit Breaker Control Brings Significant Savings

Exclusive 220-volt control in the Westinghouse PR Recloser makes possible the application of conventional CO relays. This provides the flexible accurate service of an oil circuit breaker at the low, low cost of a recloser.

A number of relay schemes are readily applied to the PR Recloser. Standard timing devices, including the series trip coils, are replaced by either an a-c or d-c shunt trip coil. Multi-ratio bushing CT's are added to the recloser's condenser-type bushings in the same manner as with circuit breakers. A weatherproof relay cabinet is then mounted on the recloser's galvanized substation frame as illustrated.

The standard PR reclosing mechanism provides the same range of flexibility available with *reclosing relays.*

Recloser accessories include: manual test switch, auxiliary switches, sensitive ground tripping schemes, lockout indicating switch, capacitor trip device, thermal demand or indicating ammeters, and others.

Ask your Westinghouse sales engineer to show you how to get high-quality oil circuit breaker protection for slightly more than the cost of a standard recloser. Or write today to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

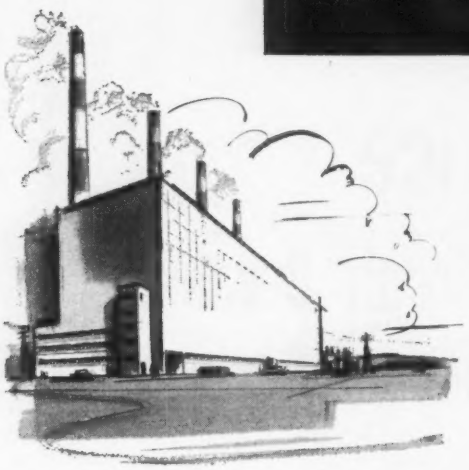
J-61000

Standard swinging relay panel contains control switch with red and green indicating lights, a nonreclosing switch, a ground fault bypass switch and circuit breaker protection of the control circuit. Space is available for at least seven additional control devices such as: Type CO overcurrent relays, Type CO ground fault relay, and indicating instruments such as demand meters, miniature ammeters, watthour meters. Reverse current relays can also be applied.

you can be sure . . . if it's

Westinghouse

...a Moloney for every application



HIGH CAPACITY GENERATING STATION TRANSFORMERS

TRANSMISSION SUBSTATION TRANSFORMERS

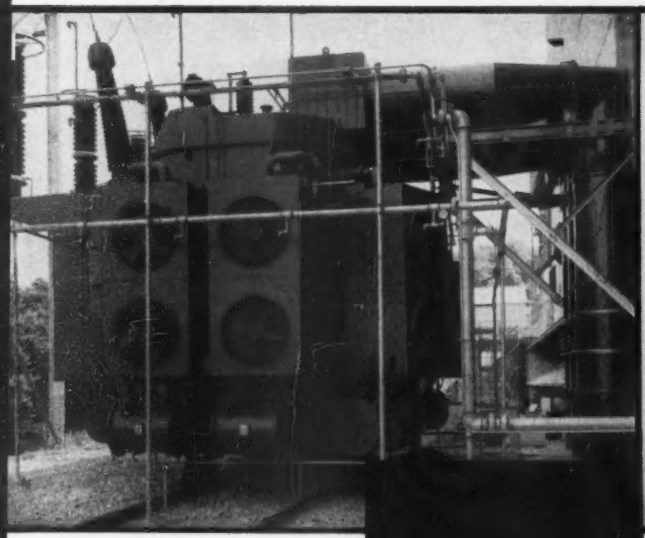
LTC TRANSFORMERS

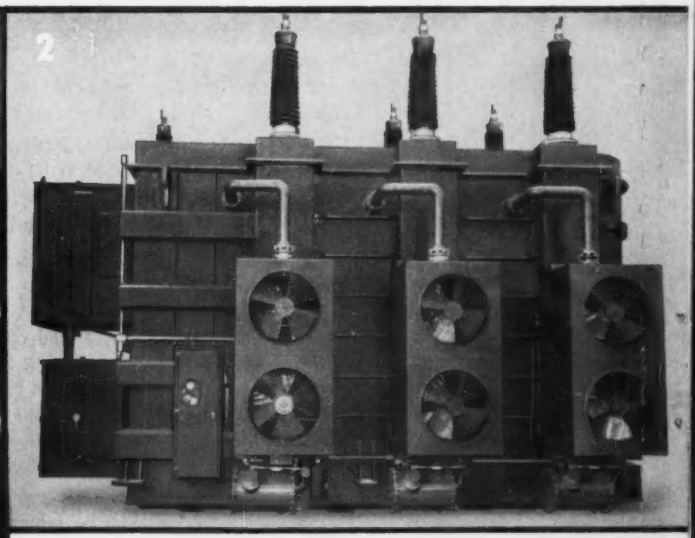
AUTOTRANSFORMERS

TRANSFORMERS OF SPECIAL ELECTRICAL OR MECHANICAL DESIGN

Versatility in transformer design and manufacture is one of the attributes which contribute to Moloney's leadership in the transformer field. Shown here are some of the many instances where Moloney has designed transformers to meet the exact requirements dictated by the peculiarities of the specific installation.

These installations exemplify the flexibility, versatility and capacity which enable Moloney to manufacture quality transformers for every application. Whatever your power transformer requirements . . . Specify Moloney Transformers . . . All Along The Line.





MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities,

FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA

Transformer

1 *217,000 KVA, Class FOA, 13.5—234 KV*
Potomac Electric Power Company

2 *160,000 KVA, Class FOA, 161—115 KV & 13.8 KV @ 42,000 KVA, LTC Autotransformer*
Kansas City Power & Light Company

3 *135,000 KVA, Class FOA, 13.8—115 KV*
New Orleans Public Service, Inc.

4 *125,000 KVA, Class FOA, 13.8—138 KV, LTC*
Union Electric Company

5 *100,000 KVA, Class FOA, 14.4—161 KV, LTC*
Iowa Power and Light Company

6 *20,000/26,667 KVA, Class OA/FA, 132—12.6 KV, LTC*
Commonwealth Edison Company

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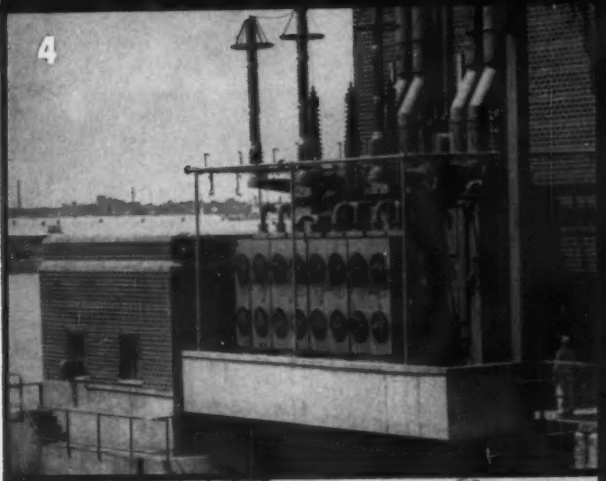

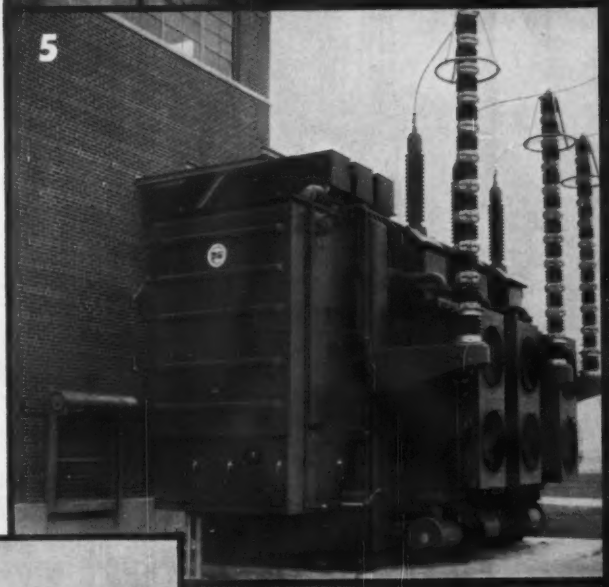

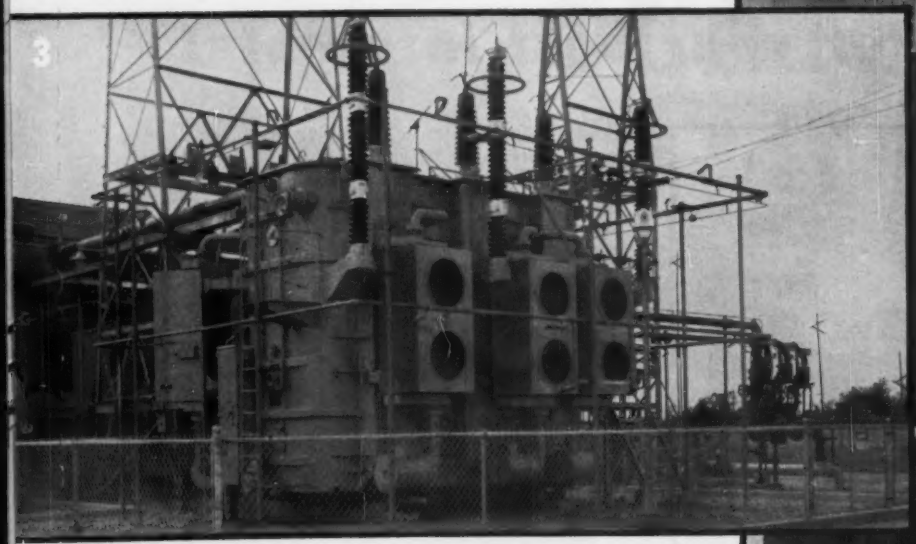

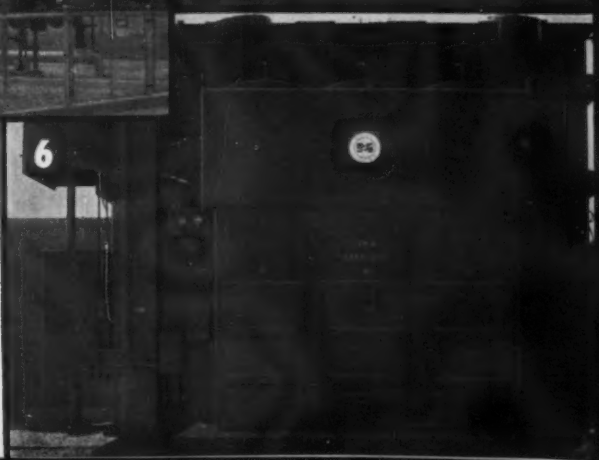

Industry and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES

ROEBLING GAS-FILLED CABLE!
looks out for your best interests!

Impregnated paper/insulation, with shielding.
Two steel spirals conduct inert gas to all parts of cable to prevent ionization and provide self-supervisory properties.
THE SHEATH ON THIS CABLE . . . is one more reason why it's a best, buy! The Tellurium-Lead Alloy Sheath offers the best possible resistance to fatigue and age-hardening problems . . . has 90% less creep, 4½ times greater bending life!
Solid copper tubing is open at splices, assuring constant gas pressure in spiral tubes.
Non-magnetic shielding tape over cable core.

Roebling Gas-Filled Cable (for voltages up to 46 kv) is *self-supervisory!* Super-dry nitrogen gas, inside this cable at approximately 12 p.s.i. pressure, is the key. When gas pressure drops below 10 p.s.i. or rises above 16 p.s.i.—an automatic signal message is relayed to the nearest attended station. You know when trouble's afoot the second it starts! Repairs can be made *before* serious damage occurs!

Along with this extra *protection*, this cable has properties that lessen the possibility of outages! The inert dry nitrogen gas provides consistent dielectric properties throughout the length of the cable. It prevents ionization, too, and the other problems often associated with solid-type oil-impregnated cable. What's more, it's as easy to splice as solid-type! And if your system includes grades, it may prove to be the most inexpensive cable you've ever used!

Our new Gas-Filled Cable book tells more about this superbly-made cable. It's free—write for it. Roebling's Electrical Wire Division, Trenton 2, New Jersey.

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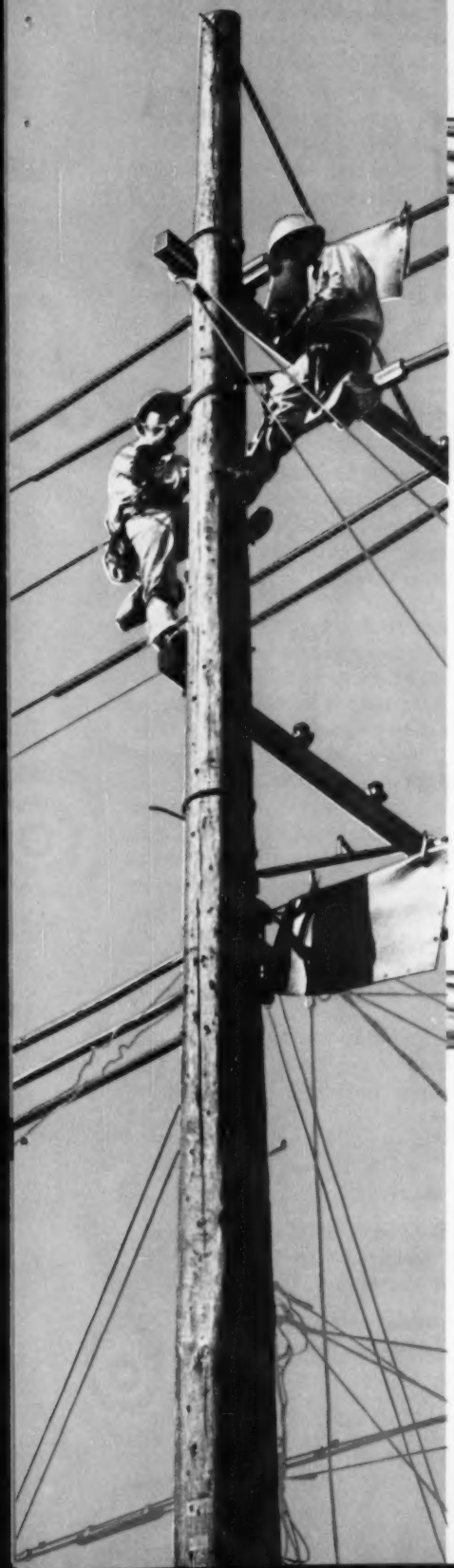
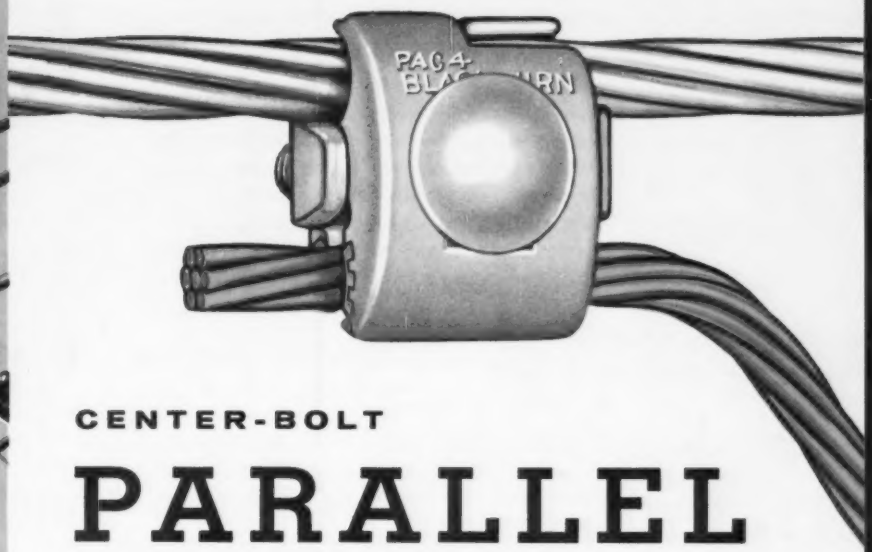
Data Folder

FOR THE ELECTRICAL POWER AND LIGHT INDUSTRY

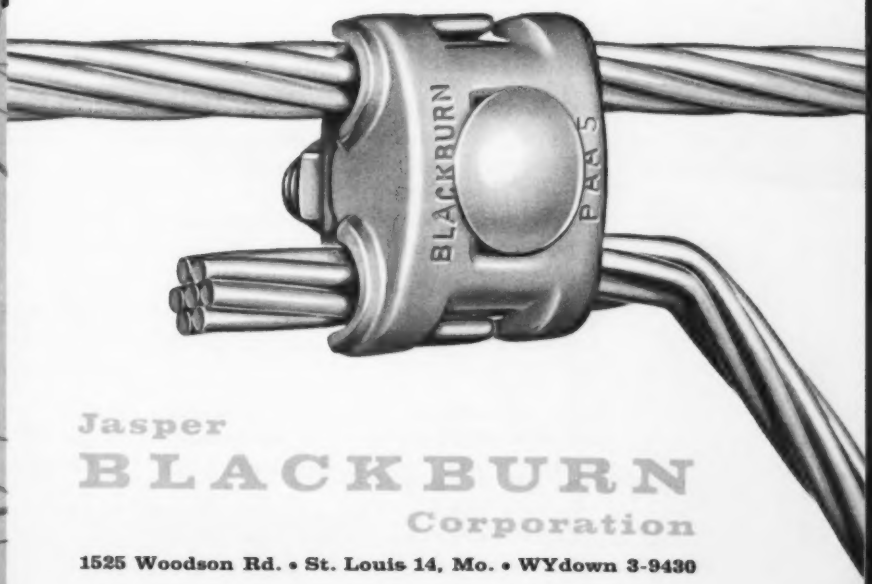




CENTER-BOLT

PARALLEL GROOVE CLAMPS

BULLETIN #6007



Jasper
BLACKBURN
Corporation

1525 Woodson Rd. • St. Louis 14, Mo. • WYdown 3-9430

ENGINEERED for improved connection performance

Blackburn aluminum center-bolt parallel groove clamps are designed for long lasting, low resistance service. Trouble-free operation is attained by built-in features engineered to counteract the "common foes of good connections"—differential thermal expansion, conductor creep and galvanic corrosion.

Adequate spring action within the clamp overcomes differential expansion effects—such as those caused by placing copper conductors in aluminum clamps—and conductor creep. In addition to the inherent leaf-spring action of the center-bolt parallel groove clamp, Blackburn clamps are constructed of high yield strength aluminum alloys which provide spring-back over a broad range. This means that the clamp maintains pressure on the conductor throughout its life.

Galvanic corrosion effects are minimized by wide separation between conductors. The greater the separation of the dissimilar conductors, the less the possibility of formation of damaging corrosion "bridges". The use of pressure cast copper liners in the PAC Series prevents direct contact between copper conductor and aluminum clamps.

Other trouble preventing features of Blackburn parallel groove clamp design are rugged lock washers to prevent loosening of the connection due to vibration, and special surface treatment to provide low resistance contacts.

APPLICATION for many types of connections

Center-bolt parallel groove clamps are used on a wide variety of aluminum to aluminum and aluminum to copper connections such as service and equipment taps and service entrance connections.

All clamps are readily installed with standard tools—adjustable, box end, open end or socket wrenches, and standard vise-grip hot stick attachments.

PAC Series—aluminum body with one copper-lined groove—assures maximum performance and long life on troublesome aluminum copper connections. Copper conductor is in contact with copper groove, aluminum conductor is in contact with aluminum body.

PAA Series—all aluminum construction—designed primarily for aluminum to aluminum connections. This series can be used for aluminum to copper connections if wires and contact surfaces of connection are sealed with oxide-inhibiting **Contax.**

When making connections, first, wire-brush the conductors thoroughly to remove insulating oxides. Then apply oxide-inhibiting Contax to the conductor and grooves of connector. Next, insert wires in grooves and tighten bolts.

To assure application of Contax to all connections involving aluminum, we recommend use of the prefilled parallel groove clamps which are furnished with Contax applied to the grooves of the connector and then sealed with an easily removed polyethylene cover.

MATERIAL is strong and corrosion-resistant

PAC Series Bodies—high-strength, corrosion-resistant L 214 Aluminum Alloy—typical tensile strength 41,000 PSI—pressure cast to a splined, pure copper liner. No corrosive solder or flux is used to secure copper liner to the aluminum body.

PAA Series Bodies—sand cast of high-strength, corrosion-resistant 356-T6 Aluminum Alloy—typical tensile strength 33,000 PSI.

Bolts—heat-treated C1018 carbon steel, completely hot-dipped galvanized—typical tensile strength 74,000 PSI. Carriage-head bolts furnished as standard—hex head bolts available on request. Aluminum Alloy 2024-T4 bolts (and nuts) completely Alumilited are also available. (Because of the cross-sectional area of ⅜″ bolts, steel hardware is recommended as best to withstand the torques applied by linemen.)

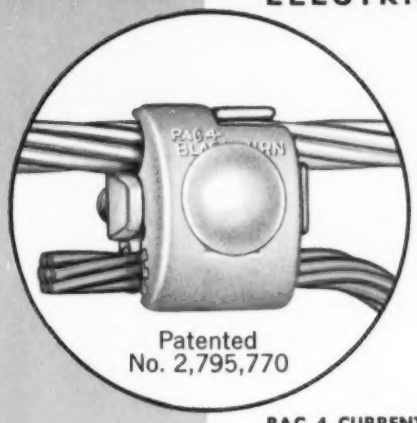
Nuts—high-strength B1108 carbon steel, hot-dipped galvanized on PAA's, heavily nickel-plated on PAC's.

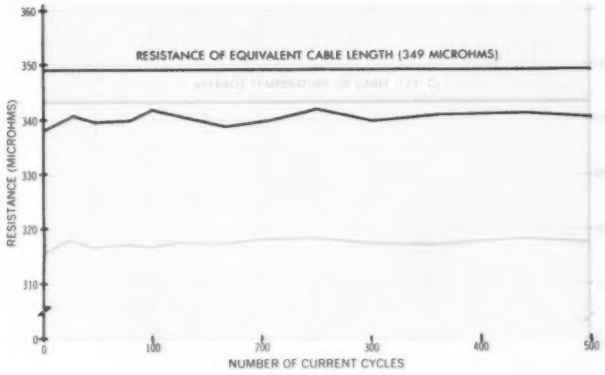
Lock Washers—tempered carbon steel, completely galvanized to A. S. T. M. Standard A153-53.

Jasper
BLACKBURN
Corporation

PERFORMANCE

ELECTRICAL:





PAC 4 CURRENT CYCLING TEST CONDITIONS (ALUMINUM TO COPPER CONNECTION)

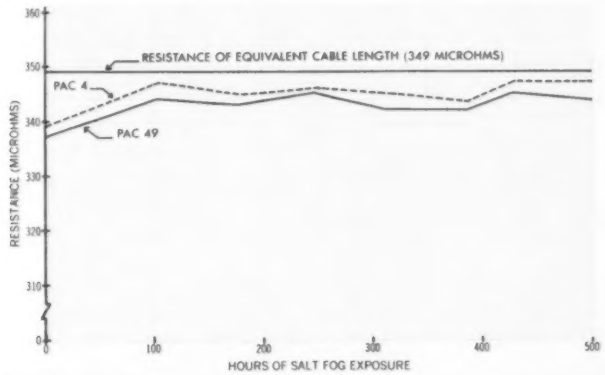
CONDUCTORS: #1/0 ACSR (6/1).
#2 (7 strand) copper.
Wire brushed before assembly.
TOTAL LENGTH OF CONNECTION: 25½ inches.
TIGHTENING TORQUE: 240 inch-pounds.
AMBIENT TEMPERATURE: 25° C.
CABLE TEMPERATURE: 125° C (of the #2 stranded copper).
CYCLING CURRENT: 244 amperes, 1 hour "on", 1 hour "off".
COMPOUND USED: None.

Electrical resistance was measured by the potential drop method over the length of the connection during the "off" portion of a cycle.

Temperature was measured using a thermocouple imbedded in the connector.

All test conditions conformed to E. E. I. Tentative Specification 59-70. Connectors meet Class A Requirement of this Specification.

CORROSION RESISTANCE:



PAC 4 & PAC 49 SALT FOG EXPOSURE TEST CONDITIONS (ALUMINUM TO COPPER CONNECTION)

TEST PROCEDURE: ASTM Standard B117-57T (5% Salt Fog).
CONDUCTORS: #1/0 ACSR (6/1).
#2 (7 strand) copper.
Wires brushed before assembly.
TOTAL LENGTH OF CONNECTION: 25½ inches.
TIGHTENING TORQUE: 240 inch-pounds.
COMPOUND USED: PAC 49: "Contax" as furnished in connector.
PAC 4: None used.
MEASUREMENTS: Resistance was measured by the potential drop method over the length of the connection.

ORDERING DATA

Catalog Number	Main		Tap
	ACSR	AWG	Copper
PAC 3	2—8	2—6	2—8
PAC 4	1/0—6	1/0—4	2—6
PAC 5	1/0—8	1/0—6	1/0—8
PAC 7	336.4—1/0	400—2/0	1/0—8

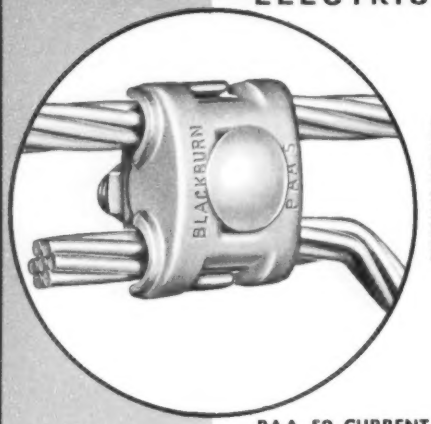
To Indicate Contax Prefilled, add Suffix "9" to Catalog Number—e. g. PAC 49

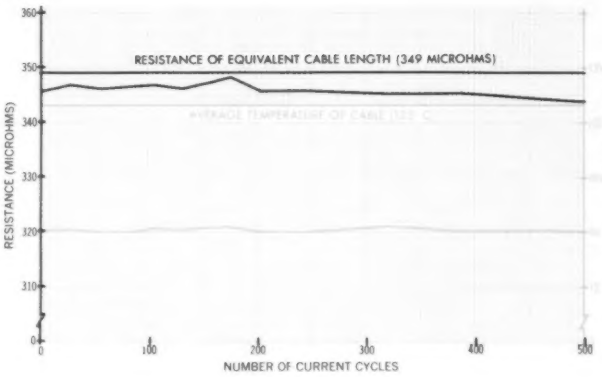
See back page for PAA Series information ▶

PERFORMANCE

PAA SERIES

ELECTRICAL:





PAA 59 CURRENT CYCLING TEST CONDITIONS (ALUMINUM TO ALUMINUM CONNECTION)

CONDUCTORS: 2 #1/0 (7 strand) aluminum.
Wires brushed before assembly.

TOTAL LENGTH OF CONNECTION: 25½ inches.

TIGHTENING TORQUE: 240 inch-pounds.

AMBIENT TEMPERATURE: 25° C.

CABLE TEMPERATURE: 125° C.

CYCLING CURRENT: 260 amperes, 1 hour "on", 1 hour "off".

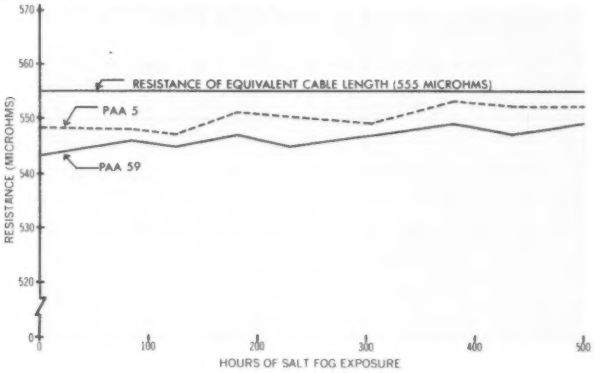
COMPOUND USED: "Contax" as furnished in connector.

Electrical resistance was measured by the potential drop method over the length of the connection during the "off" portion of a cycle.

Temperature was measured using a thermocouple imbedded in the connector.

All test conditions conformed to E. E. I. Tentative Specification 59-70. Connectors meet Class A Requirement of this Specification.

CORROSION RESISTANCE:



PAA 5 & PAA 59 SALT FOG EXPOSURE TEST CONDITIONS (ALUMINUM TO ALUMINUM CONNECTION)

TEST PROCEDURE: ASTM Standard B117-57T (5% Salt Fog).

CONDUCTORS: 2 #2 (7 strand) aluminum.
Wires brushed before assembly.

TOTAL LENGTH OF CONNECTION: 25½ inches.

TIGHTENING TORQUE: 240 inch-pounds.

COMPOUND USED: PAA 59: "Contax" as furnished in connector.
PAA 5: None used.

MEASUREMENTS: Resistance was measured by the potential drop method over the length of the connection.

ORDERING DATA

Catalog Number	ACSR		ALUMINUM	
	Main	Tap	Main	Tap*
PAA 2	2—6	2—6	2—6	2—6
PAA 4	1/0—6	1—6	1/0—6	1—6
PAA 5	1/0—8	1/0—8	1/0—6	1/0—6
PAA 6	1/0—8	1/0—8	1/0—6	1/0—8
PAA 8	336.4—1/0	1—8	400—1/0	1—8
PAA 10	336.4—1/0	1/0—8	400—1/0	1/0—8
PAA 12	4/0—2	4/0—2	4/0—2	4/0—2
PAA 400	336.4—1/0	336.4—1/0	400—1/0	400—1/0

To Indicate Contax Prefilled, add Suffix "9" to Catalog Number—e. g. PAA 69.

Jasper
BLACKBURN
Corporation

1525 Woodson Rd. • St. Louis 14, Mo. • WYdown 3-9430

The Electrical Week

LATE NEWS

AEC withdraws proposal for 50-Mw Los Angeles-Pasadena reactor as Allis-Chalmers questions price bid. Re-examination will not kill plan for reactor . . . Public hearing for full operating license for Dresden is set for Sept. 26 in Germantown, Md.

California authorizes Zinder & Associates to look at coordination of 500-kv California-Northwest intertie with Canadian and Colorado River basin projects. Zinder claims studies showed 10-billion-kwhr annual surplus could be brought to southern Caifornia at 4-mill rate, based on zero power cost from Bonneville. Plan worries southern California irrigation districts, whose projects hinge on sale of power.

FPC sets Sept. 13 for oral arguments on Grand River Dam Authority, Okla., controversies. At issue are application to boost capacity from 45 to 100 Mw and rate case between Authority and PS of Oklahoma. Co-ops are fighting rate agreement as beneficial to private utility but detrimental to Authority and co-op bulk power customers.

Maine Supreme Court directs state PUC to boost determination of fair rate base in Central Maine Power Co case. Court rules 5.75% is fair return allowed by PUC . . . KU asks circuit court to restrain county judge from proceeding with condemnation action on utility's properties in city of Princeton, Ky.

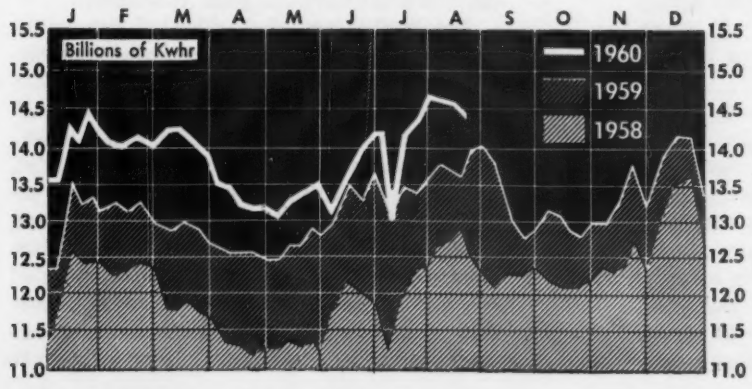
Pacific G&E gets okay from AEC lawyers on 50-Mw Humboldt Bay reactor with new pressure suppression system. Next step is for AEC examiner to make recommendation to full commission . . . New England utilities will get 'round-the-clock weather broadcasts in experimental radio program.

Three Westinghouse employees change pleas from "not guilty" to "guilty" in Philadelphia anti-trust case on power switchgear assemblies. GE and Westinghouse ask court to postpone case until spring session. GE's vp A. F. Vinson requests separate trial.

GE raises published prices of 50 and 100-kvar capacitors 4% effective Aug. 29. Published prices on equipment using these units will be increased correspondingly.

Management changes . . . Boston Ed elects C. F. Avila president . . . R. G. MacDonald (West Penn vp) is named Potomac Edison president . . . R. T. Leary becomes vp-marketing, Cornell-Dubilier Division, Federal Pacific Electric.

WEEKLY POWER OUTPUT—Up 3.2% (Week Ending August 20), Kwhr 14,453,000,000



Per Cent Change From Previous Year

	Aug. 6	Aug. 13	Aug. 20
Total U. S.	+ 7.6	+ 7.1	+ 3.2
New Eng.	+ 7.2	+ 4.1	− 0.3
Mid. Atlan.	+ 1.2	+ 5.0	− 3.8
Cent. Ind.	+ 7.8	+ 6.5	+ 3.1
West Cent.	+ 3.7	+ 8.9	+ 1.3
Southeast	+ 6.4	+ 7.2	+ 3.7
South Cent.	+ 6.3	+ 9.3	+ 1.5
Rocky Mount	+11.8	+11.8	+15.3
Pacific			
NW	+ 5.2	+ 4.5	+ 5.7
SW	+ 7.7	+ 9.3	+14.2

Seasonally Adjusted Index 264.6

Week Ago 267.9 Year Ago 250.3

Source: Edison Electric Institute

Preview of This Issue

EVENTS ▶ **Hydro project growth of 6,280-Mw** by 2000 AD at $22-billion cost is seen by Bureau of Reclamation water resources report. For a look at where the money will go, see **page 50** . . . Five inter-agency river basin groups at first joint meeting puzzle over future role. Aandahl urges caution as some members press for stronger stand on controversial issues **(p 54)** . . . Washington Public Power Supply System files new application increasing Nez Perce Dam size. Project reportedly would be largest in Western Hemisphere . . . Yankee A-plant goes critical **(p 53).**

ENGINEERING ▶ **Saving of $10 million over next five years** is seen in revised distribution transformer loading policy adopted by Pacific G&E. New practices are based on higher maximum transformer loadings and ambient temperatures **(p 56).**

Seven 330-kv oil-filled cables carry output of four 80-Mw generators from underground transformers to overhead lines in Australia's $1-billion Snowy Mountains Project in New South Wales **(p 60).**

SPECIAL REPORT ELECTRIC UTILITY METHODS ◀ **Featured in the fourth EUM report for 1960, beginning on page 77:** TV cameras in SoCalEd's unattended hydro plant provide remote station with operational and environmental intelligence for efficient control **(p 94)** . . . Relay testing with Southwestern Electric Power's mobile test lab ignores the weatherman **(p 96)** . . . Quick start-up procedures, developed for turbogenerators at Detroit Edison's Delray Plant, avoid equipment-damage due to thermal shock **(p 98).**

Politics and Public Power

KERR SPELLS OUT WATER PHILOSOPHIES

Sen Robert S. Kerr (D-Okla.) has set down at length his detailed philosophies on national water resource development in a new book, entitled "Land, Wood and Water."

Kerr's views are of major interest to utilities because of the leading role the senator plays in Congressional power and water resource legislation. He is co-sponsor of the Kerr-Trimble Bill (in the Senate and House, respectively) to revise cost allocations at federal multi-purpose projects. And he is chairman of the potent Senate Special Water Resources Committee, which will recommend a 40-year US water development program this winter (see page 50).

The Oklahoma senator's book dwells mostly with his opinions on what needs to be done to prevent droughts, floods, pollution, water and power shortages. Kerr ends the book with a glowing meditation on a reclamation monument dedicated to himself and other Oklahomans. In between he runs the verbal gamut to drive home his demands for a strong, national water policy.

Tennessee Valley Authority—". . . the opposition to TVA is futile. We are not going to dismember it and sell its legs and arms and head to various bidders . . . at the same time, we are not going to permit the TVA to go afield, beyond its present service area, to impair or supplant private utilities serving other markets . . . The existence of TVA as a huge, healthy, profitable government step into power generation and transmission makes all the gloomy head-shaking about government power a little unseemly. It is there. It works. Its customers are happy and thriving. It keeps a brake on private power rates. It poses a threat: In another wave of social reform, TVA's could be created in other great river basins."

New "valley type" authorities—"I believe that the cooperative [inter-agency coordinating committee] plan in the Arkansas-White-Red River Basin will in the long run be more satisfactory than the Valley Authority, and I believe it, also, is democracy at its best . . . More often the people prefer to do it their own way, coordinating all the agencies of the government, rather than being directed by an authority appointed from Washington. My plan being tested in the Arkansas-White-Red Basins proves that we can have all the benefits, without surrendering any local authority or being without the

PROCUREMENT & PRODUCTS ▶ **Continued tight supply and firm (or higher) prices for residual fuel oil** are expected in the Northeast following major Interior Department decision . . . Two more insulator manufacturers—H. K. Porter's Delta-Star Electric Division and Joslyn's Pinco Division—increase prices 5% **(p 67).**

Manufacturers News: EEI half-year report shows upturn in generating equipment ordered by US power systems from domestic sources . . . GE's Project EHV nears completion of its first phase. Project will ultimately operate in 650 to 750-kv range . . . Line Material's new lab tests equipment up to 700 kv **(p 72).**

MANAGEMENT ▶ True meaning of "public" and "private" power still escapes two out of three of the industry's own customers. And to make matters even worse, some 40% of the industry's customers still labor under the misconception that they are buying "public" power. These are only a few of the fascinating facts unearthed by a wide-ranging PIP survey of the industry's image and semantics **(p 147).**

SELLING ▶ **All-electric operation provides patient comfort** in West Virginia hospital. Fifty-six 1½-ton and two 3-ton heat pumps provide year-'round heating and cooling comfort. Total load for hospital is 447 kw **(p 151).**

NEXT WEEK ▶ **Radioactive probes** measure coal pile density and moisture.

experience of the established agencies."

Public-vs-private power—"There is ample room for both public and private power in our burgeoning economy. The population of this country is expected to double by the turn of the century, with 16 times as much electric power required as was consumed in 1957. This outlook for growth and progress points to the need for all the federal hydroelectric power that can be produced, plus a vast increase of electric energy from the far-flung private utilities."

In support of "big" dams—"I have heard the large reservoirs branded as 'giant silt traps,' implying early uselessness. Some people have been confused by these misrepresentations, nearly as confused as those who make them. The modern multi-purpose dam is sound and dependable, but no claims are made that it will survive for all time . . . When the part of the dam provided for silt control fills, the dam can still be operated for its original purposes, for an indefinite period. Instead of being deplored, these rich deposits in the storage basins will be considered a blessing by future generations, in my opinion. The very presence of the precious silt makes a case for the project." Also, "Many downpours cannot be entirely absorbed by upstream works. The excess water is caught downstream by the larger reservoirs, serving a double purpose. Flooding is prevented and the needed water is stored for beneficial use."

Soviet power challenge—"Russia's widely-touted 'peaceful economic war of production' is sparked by a gigantic program for electric power. Other resources development is not neglected, but the communist drive for kilowatts—the machine-gun bullets of industrial war—has a high priority. It is geared to the world's largest hydroelectric potential. It is supported with fanatic zeal . . . This broad picture of mammoth Russian gains is both awe-inspiring and troubling, particularly when compared with the slowed-down pace of US water development. No acceptable excuse can be found for us, with the impressive head-start we have, if we permit them to move ahead of us . . . We must gear our resources for maximum growth and strength. Russia and Red China, dedicated to the brutal task of overcoming and dominating our civilization, are pressing dangerously onward. We can and will meet this challenge, by making full use of our own abundant soil and water resources."

Executive Reader

The US output of goods and services will rise by nearly $25 billion over the next eighteen months to a rate of more than $525 billion by the end of 1961 (measured in today's prices). The Federal Reserve index will rise in step with Gross National Product from 109 last quarter to a bit above 114. The economy's growth rate will be a little over 3 percent a year, as compared with an average of a little less than 3 percent for the past half-dozen years and a potential growth rate of 4.2 percent. The rise may be broken by dips like those of 1956, 1959, or 1960, but a recession on the order of 1954 or 1958 is definitely not in sight now. **Fortune, July, 1960.**

Rate cases are not filed every day, or even every month. The utility usually waits until return has fallen to a dangerously low level before another request for higher rates is filed. During a considerable period, therefore, the return actually earned is below the level of fairness, frequently within the range of confiscation. Revenues lost during this period are rarely if ever recouped, particularly since past losses cannot properly be provided for in future rates. In the interest of fairness, therefore, a return allowance in excess of the bare-bones cost of capital appears warranted. **Important Concepts as to Fair Return and Cost of Money, Ralph E. Badger, Public Utilities Fortnightly, July 21, 1960.**

Council for Preservation of Rural England does not seek undergrounding of 132 and 275-kv lines, its annual report emphasizes. The Council continues to appeal for strenuous efforts in research into undergrounding, however. **Electrical Times, July 28, 1960.**

Level of unemployment is now about the same as it was during 1954 slump (5%) and labor force will increase at a much faster rate in the 60's than in the 50's (also output per man-hour is gaining). It looks like a 4 to 5% unemployment figure may be here to stay in this decade, which is good news for personnel managers, since an open labor market has many positive implications, not only for hiring but also in terms of productivity and morale of present employees. **Industrial Psychology, Inc, Newsletter, August, 1960.**

What is the "administrative fallacy"? It is the assumption, constantly popping up in widely separate fields, that when affairs are working without apparent friction and through proper channels, they are working well! It is the tendency, often unconscious, to equate the "good" with the precise, with the objective, with the smoothly flowing. **The Administrative Fallacy, David McCord Wright, Harvard Business Review, July-August, 1960.**

Until a new approach to predicting the state of the art is developed, reorientation and change of direction will be common in research. In some degree this may always be a part of research, for it is doubtful that the progress of the art will ever be predictable without a measure of error. Therefore, at the present time, research managers must keep their programs under constant review in order to quickly adjust their direction to take advantage of new developments and information. **Can We Predict the State of the Art? Henry R. Hamilton, Battelle Technical Review, August 1960.**

Don't Splice It...Loop It

When Cooline L-W clamps are used on distribution deadends, trouble-free jumper loops can be formed quickly, efficiently without cutting or splicing the conductor.

Low-cost Cooline L-W clamps offer many of the advantages of heavy duty Cooline clamps for transmission lines, but are especially designed for the distribution and sub-transmission trend toward larger conductors and shorter spans.

The L-W clamp has a powerful snubbing action which has high holding power without crushing the conductor. The six models in the series cover a range from .2 to 1.3 inches in conductor diameter with more than adequate ultimate strengths.

Installation is simple since no special tools or skills are required. A few minutes with a standard wrench and Cooline L-W clamps are ready to serve the life of the line.

Just look at these many advantages: design that permits the use of continuous jumper loop without splicing conductor . . . convenience . . . high, maintained holding power . . . low installed cost. And the aluminum construction minimizes electrical losses and conductor heating.

It's certainly worth your time to investigate the many advantages of Cooline L-W clamps now.

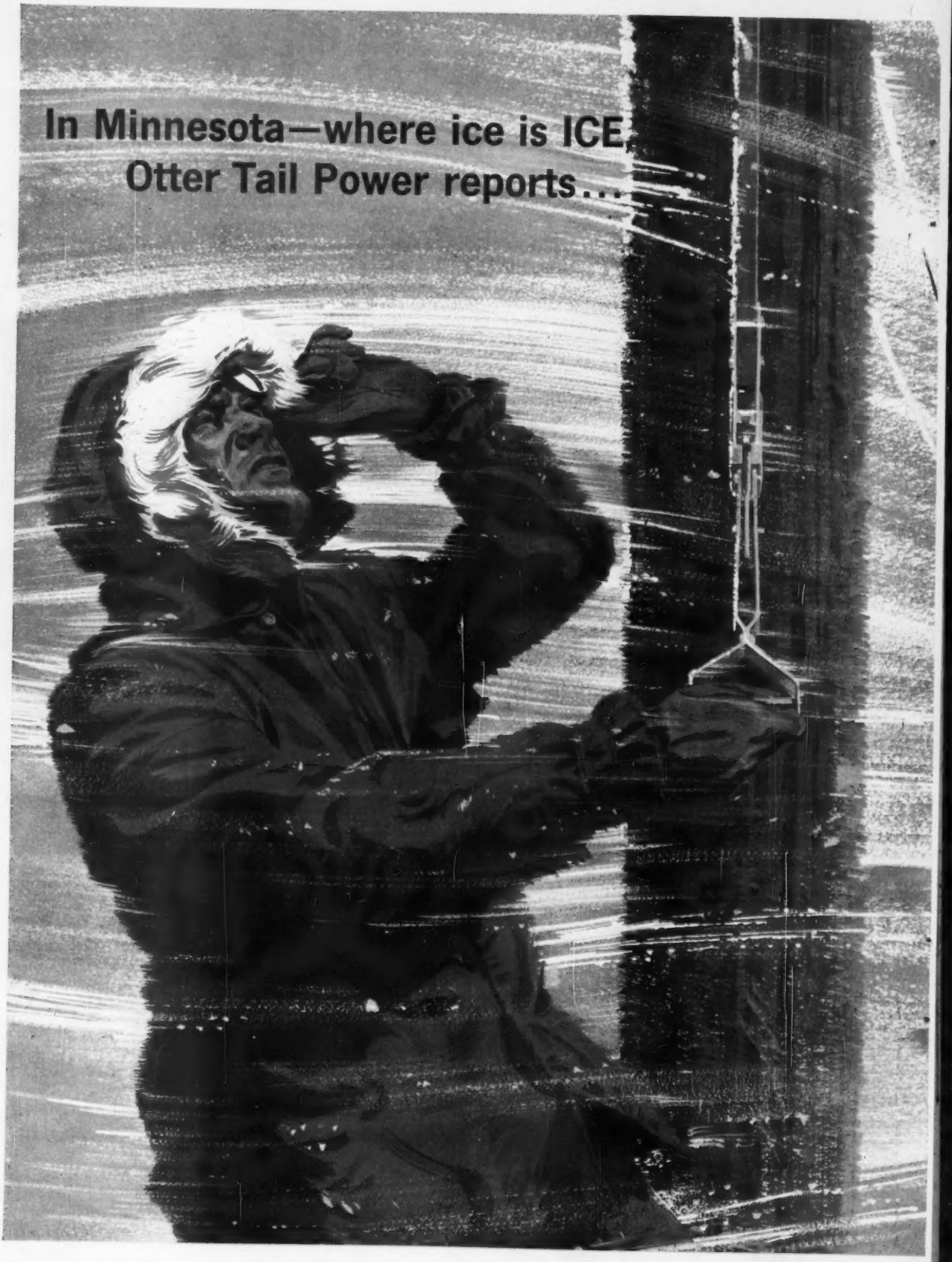
OHIO BRASS COMPANY, MANSFIELD, OHIO

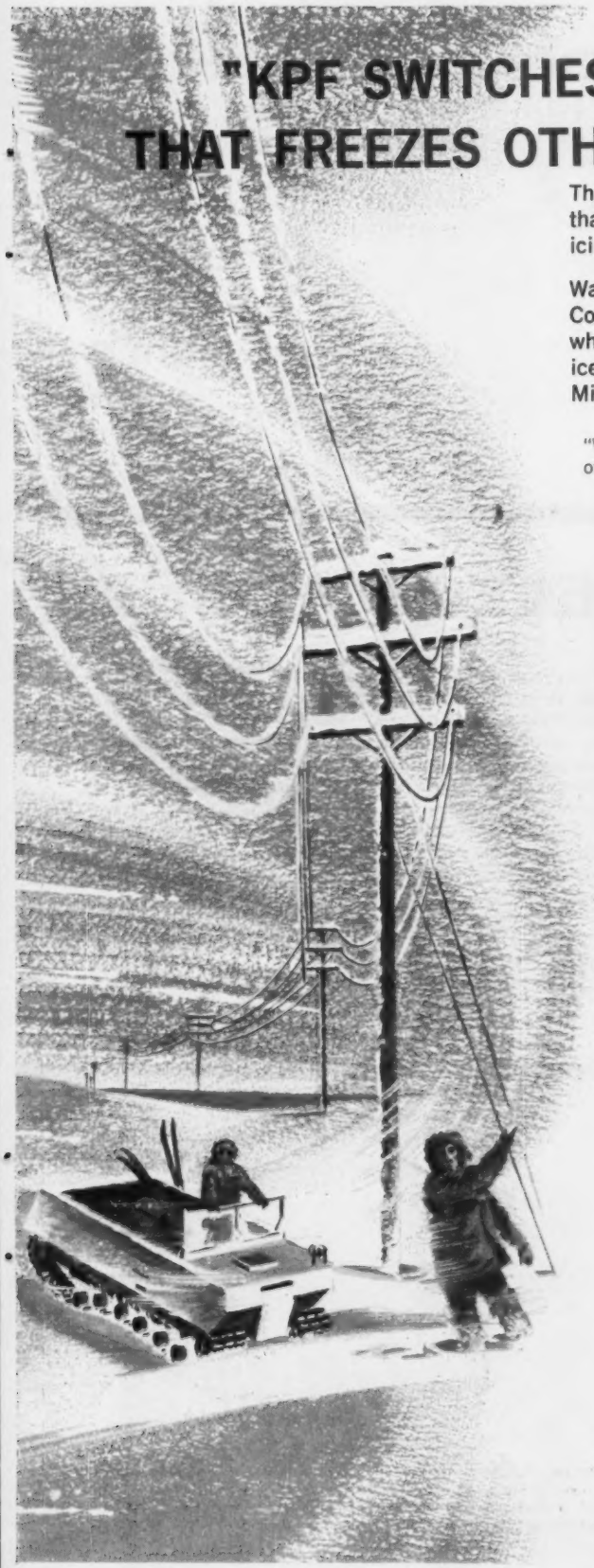
This product distributed by GRAYBAR ELECTRIC COMPANY

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10038-H


In Minnesota—where ice is ICE,
Otter Tail Power reports...



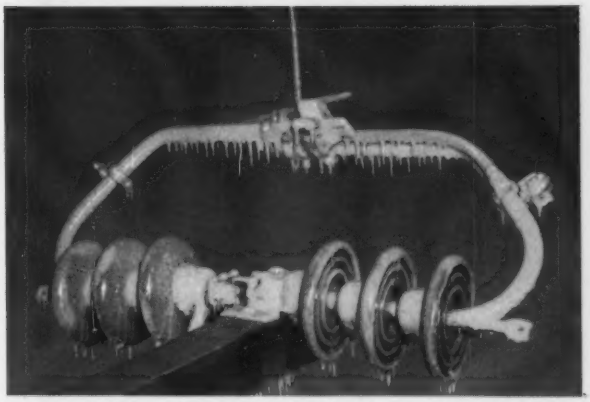
"KPF SWITCHES OPERATE UNDER ICE THAT FREEZES OTHER SWITCHES SOLID!"

The hard clear ice of northwestern winters — and the silver thaws of Texas — probably provide utility men with as much icing trouble as any set of conditions in the United States.

Warren Nye, Vice President, Electrical, of Otter Tail Power Company, has had his share of 80 mile per hour winter winds, whipping iced lines, and poles and switches sheathed in pure ice. Writing from his Company's headquarters at Fergus Falls, Minnesota, Mr. Nye says succinctly,

"We have found KPF switches easier to operate under conditions of ice than any other switch we have ever used."

HOW KPF SWITCHES CRACK OFF ICE



The mechanism of KPF switches is big, simple and rugged. There are no complex, finnicky doodads to freeze, bind or need lubrication.

A simple, positive-action control rod moves an interphase rod which rotates the blade arms of KPF phase units.

Blades and stationary clip holders are flexible so the moving arms can, literally, be "rocked" or "wobbled" by one man at the operating lever below.

The force exerted at the switchblade-clip holder position is many times that required to crack off the thickest natural ice.

The only time KPF switches have been not immediately operable under ice was when the entire pole and control rod assembly itself was sheathed in ice. It was necessary to clear ice to reach the operating lever and effect the "cracking off" process.

Install a KPF unit in your most demanding location – and watch its dependable, easy operation

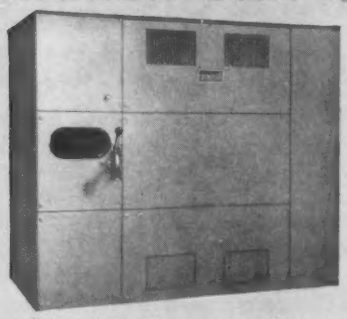
KPF ELECTRIC COMPANY
P. O. Box 1257E • Stockton, California
HOward 4-8381

KPF
AIR BREAK SWITCHES
Standard for half a century

6380

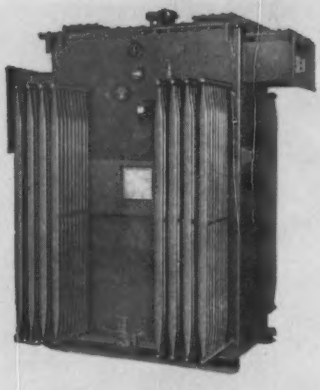
WAGNER UNIT SUBSTATION TRANSFORMERS

112½ to 2000 Kva—three phase, 60 cycles, 15 KV and below



VENTILATED DRY-TYPE—For indoor installation in reasonably dry, dust-free, well ventilated locations. Light in weight, ideal for multi-story buildings. No fireproof vaults required. Insulated for 80°C temperature rise.

for your plant's electrical system...



OIL-FILLED—Generally installed outdoors. Can be used indoors in fireproof vaults. Outdoor transformers can be connected to indoor switchgear using weather-proof bus-duct. 55°C rise, self-cooled or forced-air cooled.

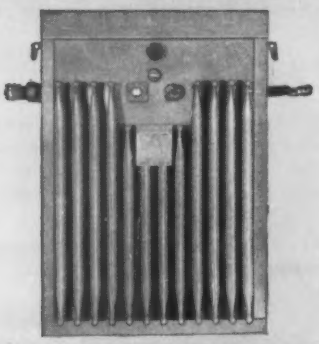
SELECT WAGNER

There's a complete line of Wagner Industrial Transformers. One or more of them will fit your specific needs whether you're planning a new plant distribution system, modernizing your present one, or adding to its capacity to meet increasing demands for power. So, select and specify Wagner Transformers. They'll give you long, dependable service because:

All Wagner Industrial Transformers are liberally designed, sturdily constructed, thoroughly tested, and able to meet the heaviest industrial demands. You get continuous, dependable power for years.

For your main plant substation, Wagner Liquid-Filled Industrial Power Transformers are available in standardized ratings through 10,000 Kva.

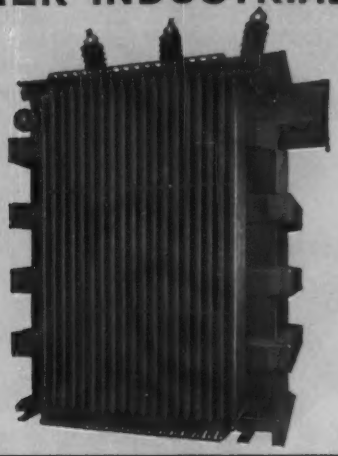
Load centers? Wagner makes PREDESIGNED Unit Sub-



NOFLAMOL—Non-inflammable liquid-filled. For indoor or outdoor installation, especially suited for chemical plants, refineries and similar locations where explosive liquids or gases are present. The close-coupled design fits flush against switchgear enclosures to save space. Throat connected designs are also available. 55°C rise, self-cooled or forced-air cooled.

SEALED DRY-TYPE—Hermetically sealed in welded steel cases to provide positive protection from contamination, fire and explosion hazards. Sealed tank is filled with inert nitrogen. Only maintenance needed is periodic checking of gas pressure. Can be safely installed in any load center.

WAGNER INDUSTRIAL POWER TRANSFORMERS



Oil-filled, for outdoor installations, available through 10,000 Kva, 67 KV and below.

Noflamol, non-inflammable liquid-filled for explosive atmospheres, available through 7,500 Kva, 15 KV and below.

The performance stability of Wagner Industrial Power Transformers is outstanding. Quality is designed and built into these transformers by specialists with years of transformer engineering and production experience. Highest quality materials... carefully controlled production methods... constant inspections and tests make sure these transformers give in-service performance that means better service for your system.

INDUSTRIAL TRANSFORMERS

station Transformers to meet your particular requirements. Furnished with suitable incoming line sections, these transformers will save you time and job engineering costs. And, you can specify the secondary switchgear you prefer.

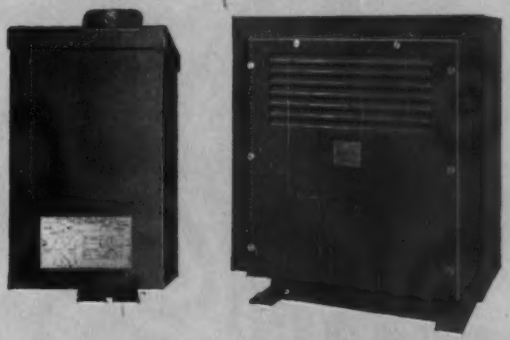
Wagner Dry-Type Distribution Transformers are an economical choice for plant areas requiring 120/240 volts, single-phase or 208Y/120 volts three-phase.

Over 65 years of constant research and development has made Wagner a leader in transformer design... made the name Wagner one of the foremost in power planning. For expert advice on your present and future plant transformer needs, call or write the Wagner branch near you.

get economical, dependable, power packages!

Wagner Electric Corporation
6456 PLYMOUTH AVE., ST. LOUIS 33, MO., U. S. A.

WAGNER DRY-TYPE DISTRIBUTION TRANSFORMERS



Single-phase 1 to 100 Kva—Three-phase 3 to 300 Kva—600 volts and below.

These dry-type distribution transformers have a low sound level, are compact and light in weight. They meet all safety requirements for indoor installation. They are economical to maintain... have no liquids, valves, gaskets or gauges.

Totally-enclosed non-ventilated dry-type transformers can be installed indoors or outdoors. Ventilated units as shown in right hand photo are for indoor installation only. Ratings through 10 Kva single-phase are filled with an epoxy compound... operate quiet as a whisper... perfect for areas where noise would be a nuisance. They, and three-phase units through 30 Kva are designed for wall mounting... other ratings for floor or platform mountings.

Available for high voltages of 120 x 240, 240 x 480, 480 and 600 volts to 120/240 volts single-phase, and 480 and 600 volts to 208Y/120 volts three-phase.

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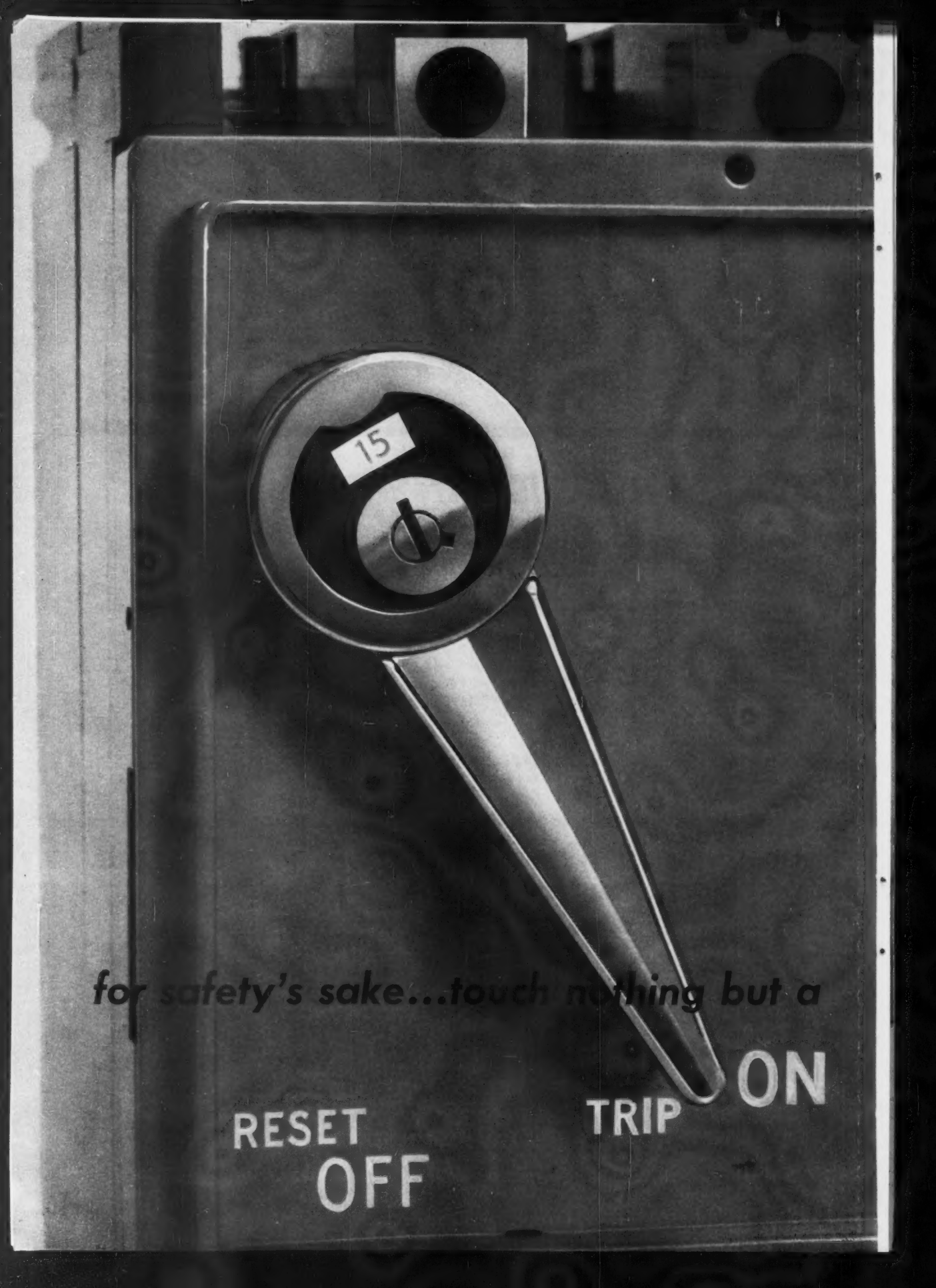
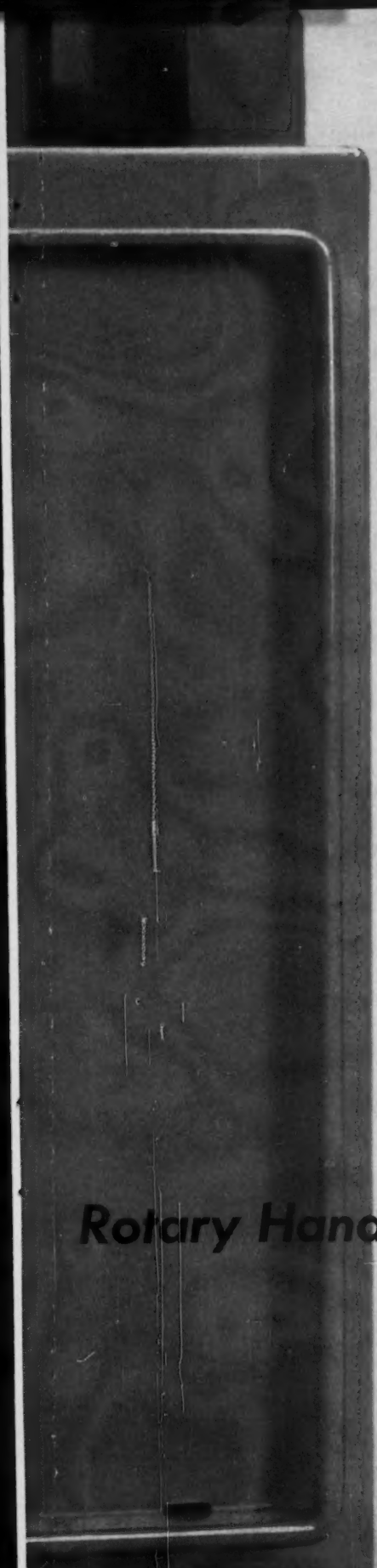
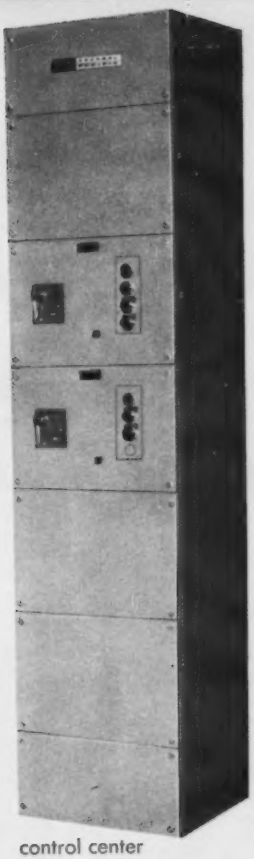
WT60-3

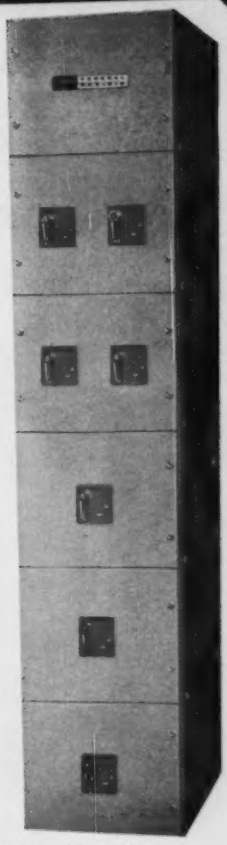

15
for safety's sake...touch nothing but a
RESET
OFF
TRIP
ON



Rotary Handle!



control center



switchboard

panelboard

enclosed circuit breaker

New and exclusive from Federal Pacific—Rotary Handle circuit breakers—the simplest, safest molded case breakers in the industry. Here is the one sure way to eliminate troublesome mechanical linkages . . . to forget all external mechanisms . . . to be absolutely certain of positive operation and true handle indication. Integral cylinder lock and locking ring for up to three padlocks are standard on all breakers. Federal Pacific breakers can be locked "on" or "off" independent of door position. Four frame sizes—15 to 800 amperes—meet all requirements for panelboards, switchboards, control centers and individually enclosed circuit breakers. Write for Bulletin 1425, Dept. FP-4, Federal Pacific Electric Company, Newark 1, New Jersey.

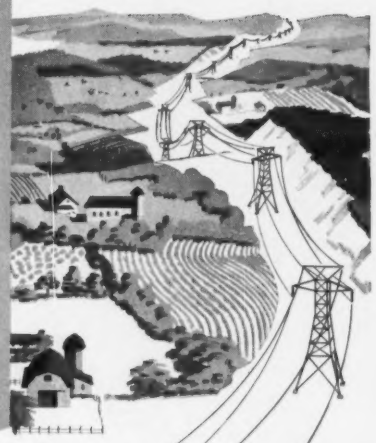
FEDERAL PACIFIC ELECTRIC COMPANY

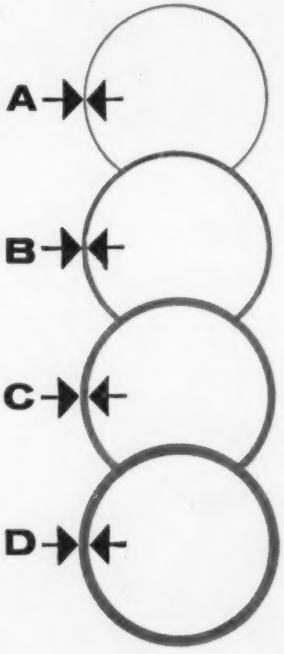
FPE

growth through creative energy

For Long Service...
For Extra Corrosion-Resistance

CHOOSE STRAND WITH A BETHANIZED COATING





The Bethanized coating is not a new type of zinc coating. But it is *proved* . . . especially in utility service where it fights off all kinds of weather . . . in rural, marine, and industrial atmospheres.

Each wire protected by high-purity electrolytic zinc

When you specify Bethanized strand, you get strand that has each wire coated electrolytically with 99.9 per cent pure zinc. The coating is uniform in thickness, and forms a tight bond—yet it is also highly ductile, making it virtually impervious to peeling and cracking.

Choose from 4 coating weights

Bethanized coatings come in four weights: A, B, C, and D. Of these, the D coating (which is furnished in Common, Siemens-Martin, and high strength grades) is heaviest, being four times the weight of the A coating. However, the A coating is adequate for any installation where atmospheric conditions are good. The C coating is three times the weight of A; the B coating is twice the weight of A.

You will find it worthwhile to look into the advantages of Bethlehem Strand. The nearest Bethlehem sales office will gladly give you full details.

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Export Sales: Bethlehem Steel Export Corporation

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for strength
. . . economy
. . . versatility

BETHLEHEM STEEL

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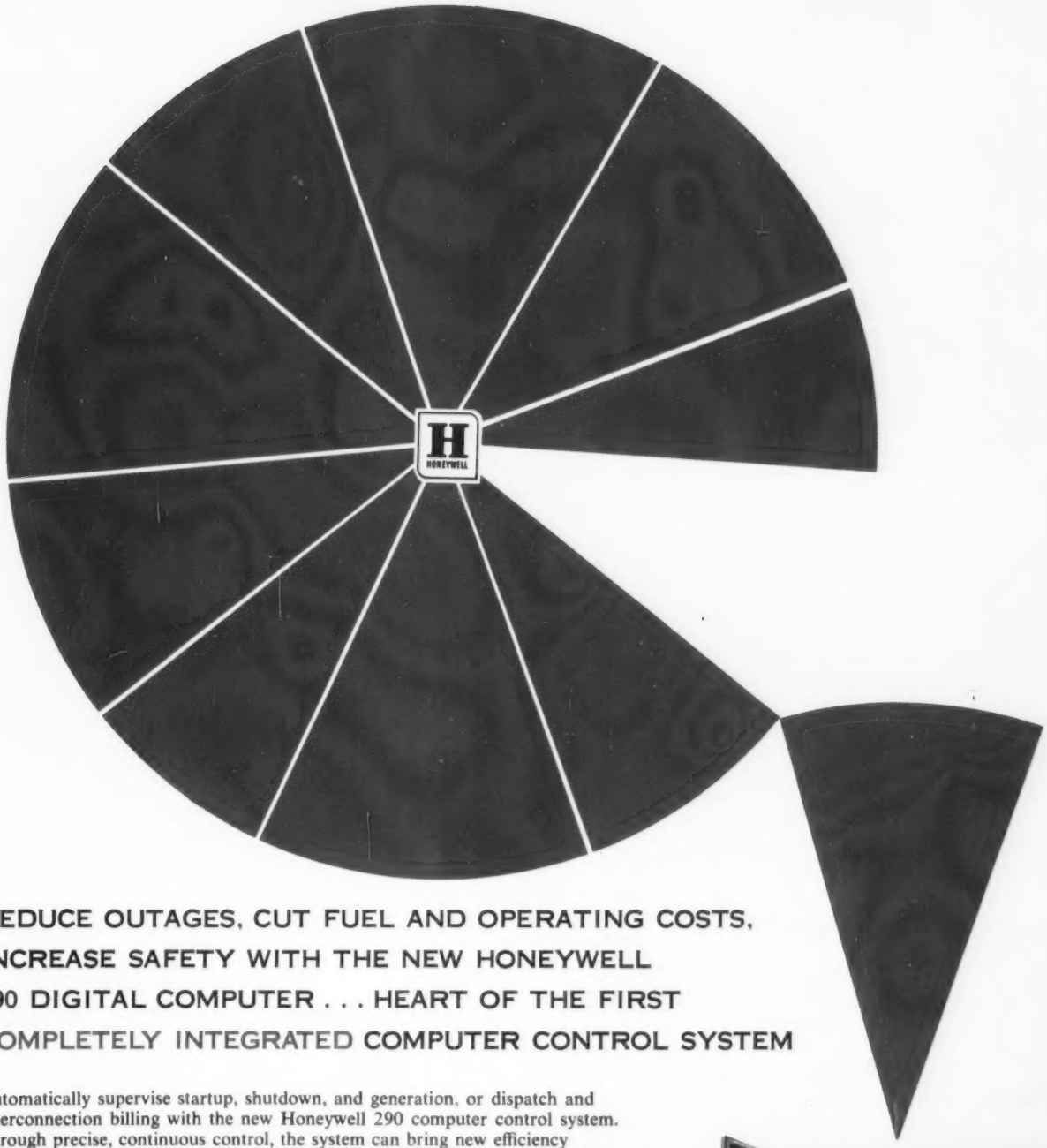
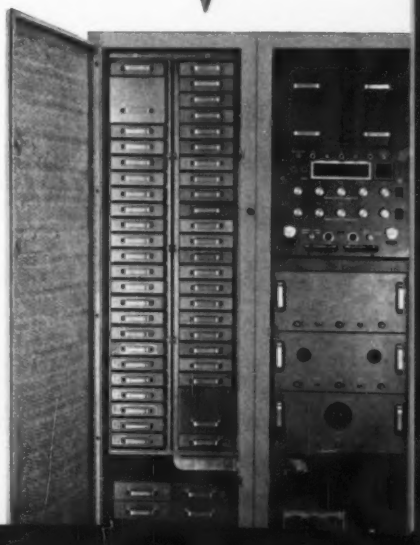


REDUCE OUTAGES, CUT FUEL AND OPERATING COSTS, INCREASE SAFETY WITH THE NEW HONEYWELL 290 DIGITAL COMPUTER . . . HEART OF THE FIRST COMPLETELY INTEGRATED COMPUTER CONTROL SYSTEM

Automatically supervise startup, shutdown, and generation, or dispatch and interconnection billing with the new Honeywell 290 computer control system. Through precise, continuous control, the system can bring new efficiency and important new economies to steam power plant operation. It can spot abnormal conditions and correct them before costly outages or serious damage can occur. It can put fuel to work with less waste, through continual monitoring of plant performance. For dispatch operations, these new systems team up with modern load control systems to assure delivery of necessary power at the most economical rate and to perform many of the tedious operations of interconnection billing.

The Honeywell 290 is the most powerful computer in its class, despite its small size, low cost and low power consumption. It performs, for example, 8,000 additions, 1,250 multiplications or 400 square root extractions per second. Unique, powerful macro-instructions help make the 290 easy to program, reduce working memory requirements and increase operating speeds. These special instructions augment the basic instructions, and eliminate many special subroutines.

The combination of high-speed operation and the reliability of conservative solid-state circuitry brings optimum control to many central station operations. In addition, the Honeywell computer control system can compile complex operating guides, correlate data, and reduce huge masses of acquired data into immediately usable information for monitoring or optimizing process operations.



NEW HONEYWELL 290 INDUSTRIAL DIGITAL COMPUTER . . . HIGH SPEED, PARALLEL OPERATION, EASILY PROGRAMMED

The high computation speed of the Honeywell 290 provides many advantages in on-line monitoring and control of industrial processes:

- Higher sampling rates give closer control because each variable can be checked more frequently.
- More work can be accomplished in a given time.
- Checking and validity routines can be used extensively.
- Tasks other than process control can be accomplished either through time-sharing or through priority instructions in the computer program.

The Honeywell 290 is the first industrial digital computer to use parallel operation within the computer. All digits in a multi-digit number are transferred *simultaneously* from one element to another within the computer . . . in one count of the clock. Therefore a much slower clock rate can be used. Components are operated far below their maximum ratings—greatly increasing overall reliability, while permitting many thousands of program steps to be executed each second.

The computer combines both magnetic core and drum memory. Main memory is the magnetic core type, and it can be supplied with capacities of 1,024, 2,048 or 4,096 words. A magnetic drum memory with a capacity of either 4,096 or 8,192 words is also provided—a total capacity of 12,288 words. This combination gives you the speed and random accessibility of core memory with the program permanence of drum memory.

The Honeywell 290 Computer operates with standard, field-proved Honeywell process instrumentation in a completely integrated system of control. *ElectriK Tel-O-Set* transmitters feed process variable input data to the computer. These solid-state, two-wire transmitters convert temperature, pressure, flow and other measurements into electric signals. Various types of computer peripheral equipment are supplied by Honeywell to add flexibility to the system and make it easily expandable to meet future requirements. This equipment includes analog-to-digital and digital-to-analog converters, high-speed paper tape readers and punches, visual displays and electric typewriters. Honeywell *ElectriK Tel-O-Set* transducers make the computer completely compatible with existing pneumatic process measuring and control instruments.

Get complete details from your nearby Honeywell field engineer. Or write for Catalog C-290. MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.

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ALUMOWELD

Aluminum-Covered Steel Wire and Strand

Alumoweld was developed to cut costs and improve performance of overhead ground wire, ACSR conductors, guy and messenger strand. Its thick aluminum covering —25% by area—gives Alumoweld corrosion resistance equal to solid aluminum wire and 33% of the electrical conductivity.

When used as overhead ground wire, remember that Alumoweld is just as strong as steel, is 18% lighter in weight, and has 3 times the conductivity. These advantages permit greater mid-span clearance, and make Alumoweld excellent for relaying and for discharging lightning currents to ground. For guys and messengers, Alumoweld Strand provides the full strength of steel and will last far longer.

These valuable properties also pay off when Alumoweld is used as core wire for ACSR conductors. Here, Alumoweld eliminates the hazard of dissimilar metals in contact, provides increased conductivity and gives you an extra-high-strength core wire that matches the life of the solid aluminum wires. For the complete story, send for Bulletin E.D. 3000.

Two Exclusive features of **ALUMOWELD**

a thick cladding of aluminum

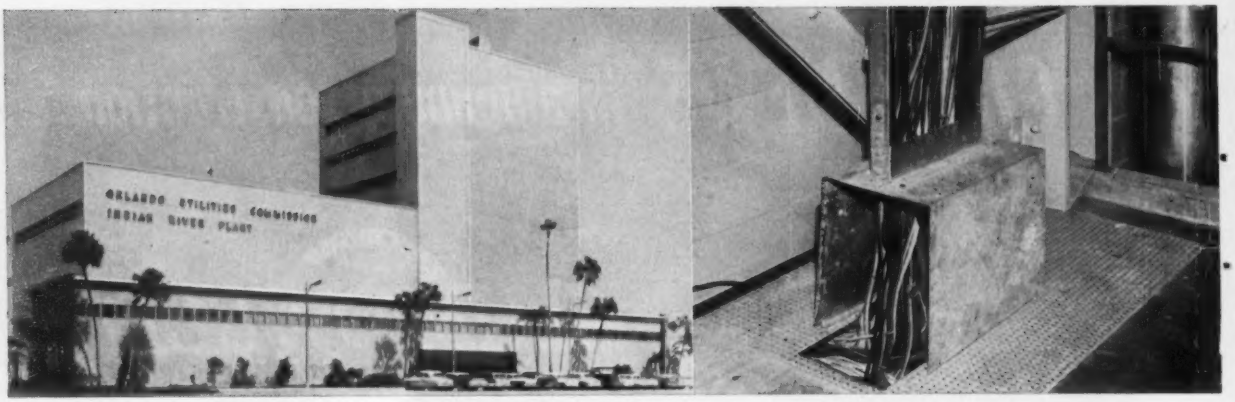
a controlled atomic weld

Alumoweld's thick aluminum covering will never crack, flake or peel. Applied by an entirely new cladding process—the controlled atomic weld —the heavy aluminum covering and the high-strength steel core are inseparably interlocked by a ductile weld that remains permanent under all operating conditions.

COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION, GLASSPORT, PA.

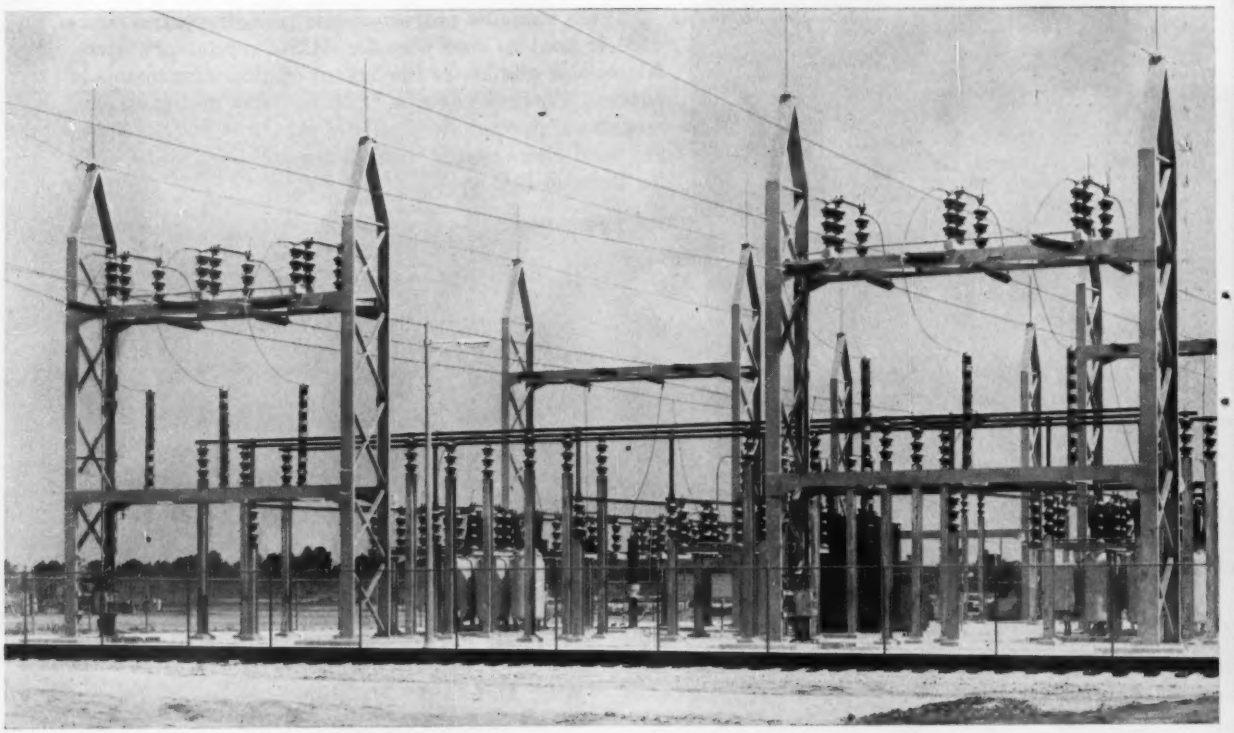
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York



Orlando, Florida, Meets the Challenge of An Expanding Population with

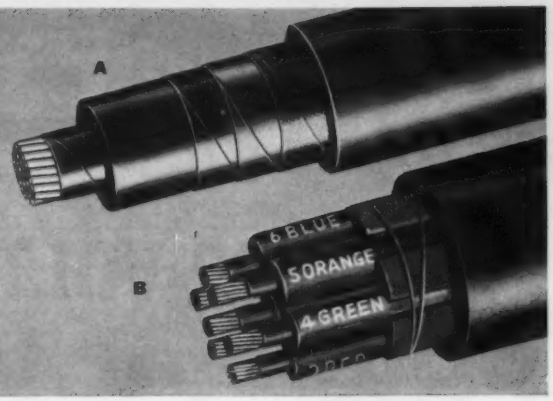
POWERIGHT PARANITE®

POWER CABLE



A. Paranite **HIGH VOLTAGE CABLES** are manufactured in a complete range of sizes—1000 through 28,000 volt single conductor, 3000 and 5000 volt three conductor. Adaptable for aerial, direct burial or underground duct installation, wet or dry location.

B. Paranite **CONTROL CABLES** are produced in a complete range of insulation and jacket types. Rubber, PVC or Polyethylene insulations are available to meet a variety of service temperature conditions.



The ORLANDO, FLORIDA, UTILITIES COMMISSION chose Paranite for its new generating plant at Indian River. From transmission line . . . to power cable . . . through control cable Paranite was specified to carry the load in serving this dynamic and growing area.

It's another case history of the nation wide acceptance of Paranite products and demonstrates once again Paranite's 70-year reputation for quality wire and dependable service. Yes . . . men responsible for power distribution know "IF IT'S PARANITE IT'S RIGHT."®

Since 1890

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ESSEX WIRE CORPORATION, Marion, Indiana

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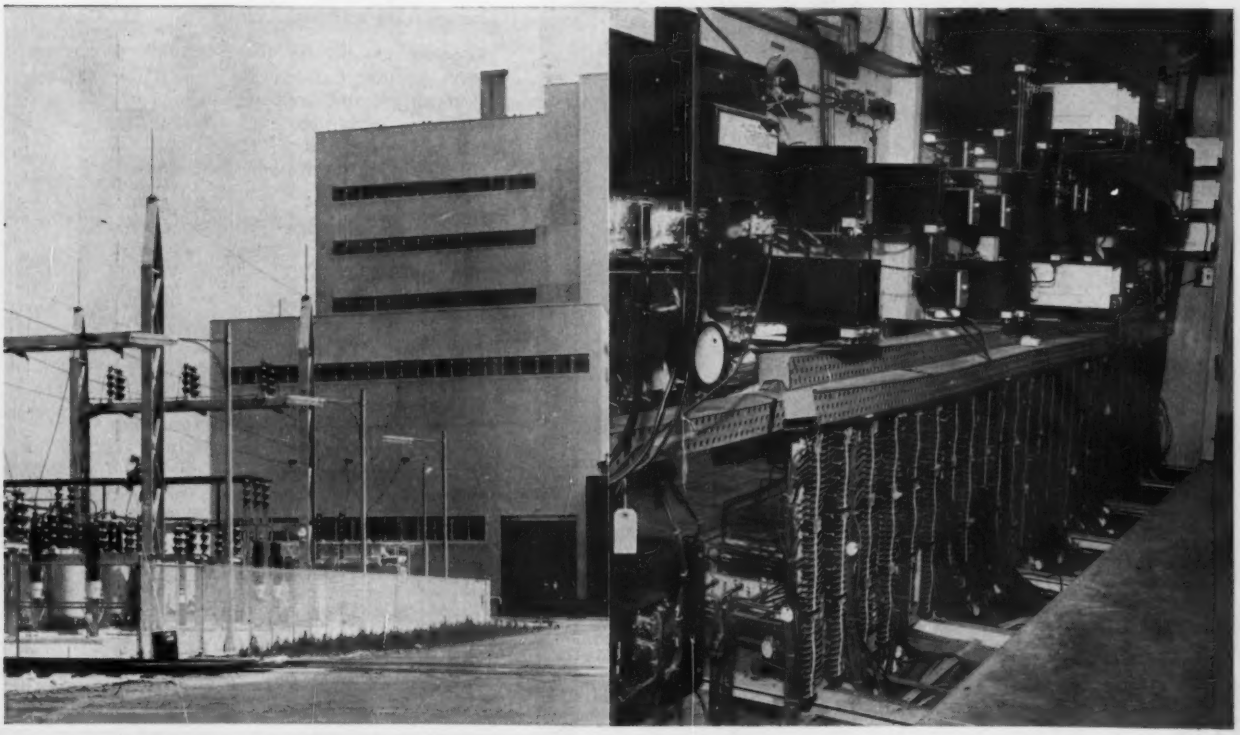

new

FIRST 600-VOLT BUTYL-MOLDED potential transformer

PRIMARY VOLTS	RATIO	BURDEN	
		W	X
		ACCURACY CLASS 60 CYCLES	
240	2:1	0.3	0.3
288	2.4:1	0.3	0.3
300	2.5:1	0.3	0.3
480	4:1	0.3	0.3
600	5:1	0.3	0.3

New General Electric Indoor-Outdoor Type JVP-O Available in 5 Ratings

Every advantage of butyl-molded construction is now available in a 600-volt potential transformer for indoor or outdoor use. Lighter, smaller and less costly than other units—General Electric's new JVP-O is designed for high accuracy on single and multiple meter applications.

20% smaller and up to 6 pounds lighter than non-butyl units, the JVP-O offers easier handling and faster mounting . . . saves valuable installation and storage space.

Rugged, chemically inert butyl protects against damage by fire, corrosion, shock and contamination. Coils are completely insulated in butyl providing long, reliable operation. *Yet the JVP-O costs dollars less than non-butyl models.*

Now available, new JVP-O potential transformers are offered in 240:120, 288:120, 300:120, 480:120 and 600:120 volt ratings. Fused models are included and secondary conduit box may be attached.

Specify the JVP-O for all 600-volt, potential applications to your nearest General Electric apparatus salesman. Or write for more information on G.E.'s complete line of butyl-molded instrument transformers to General Electric Co., Somersworth, N. H. 714-06

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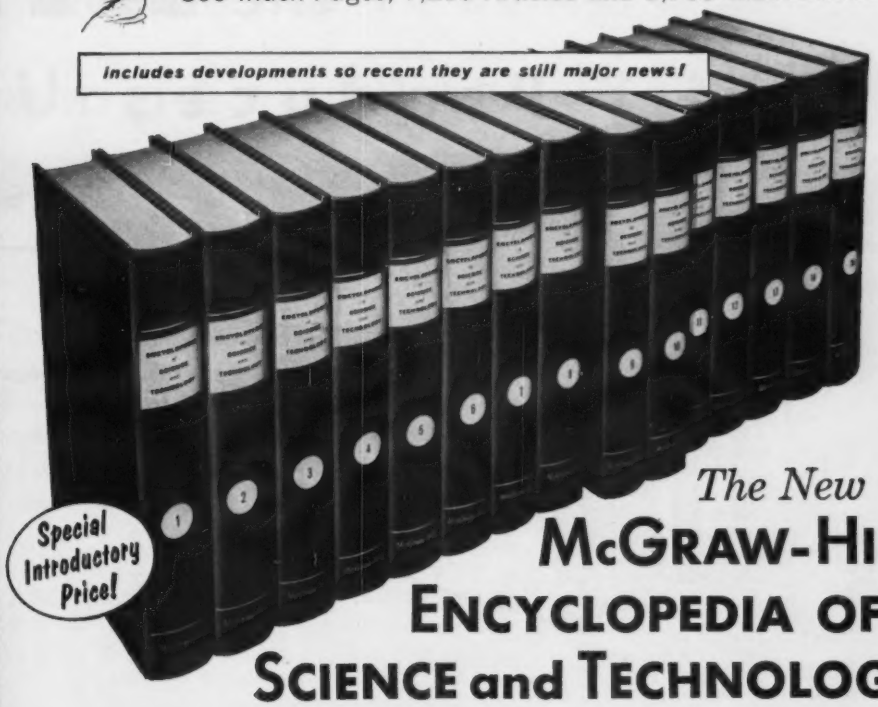

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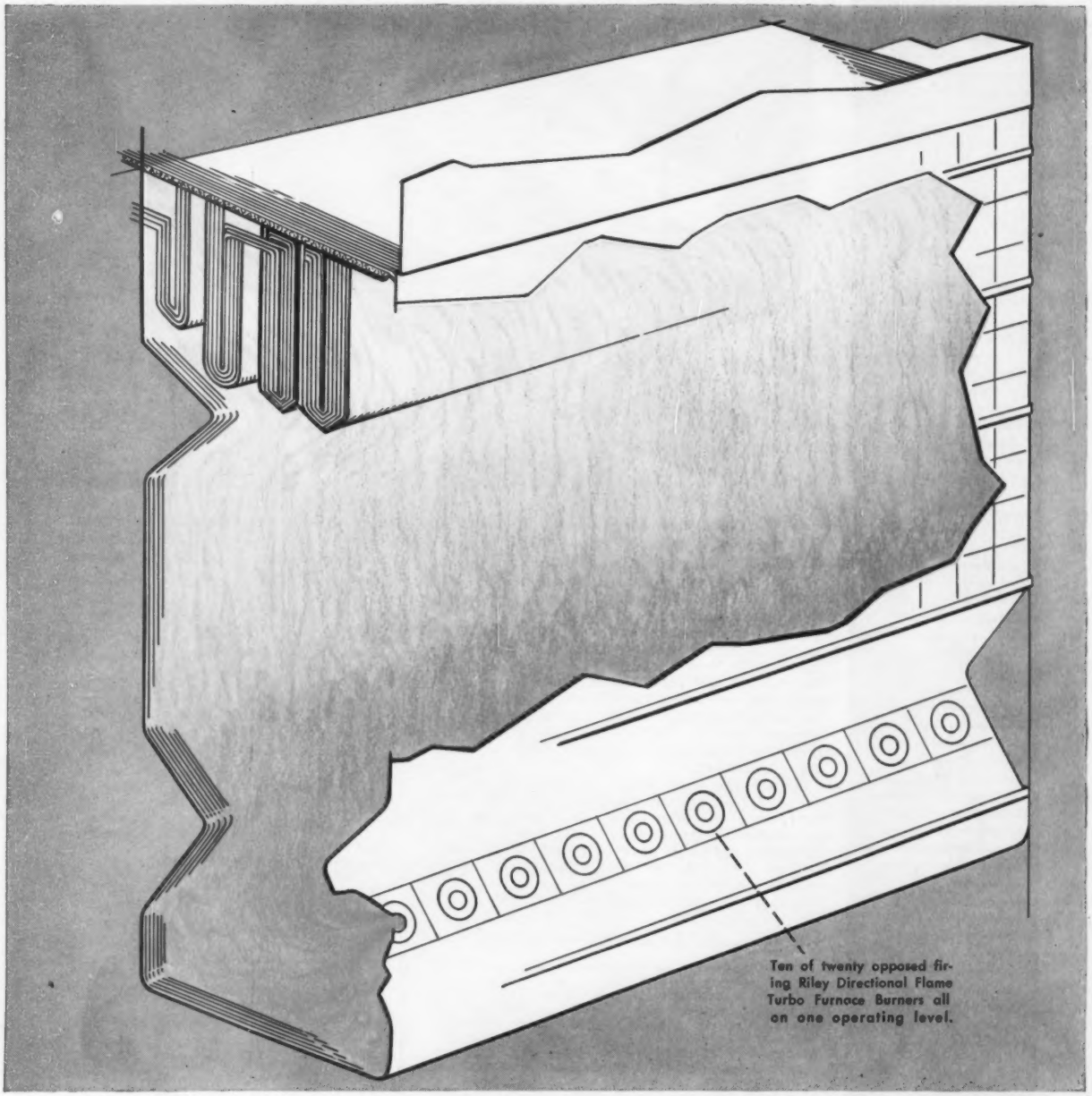

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Exit Temperature With *NATURAL* Flow of Furnace Gases

Uniform, safe gas temperatures across the full width of a boiler's high pressure elements is a vital requirement for continuous, efficient, low cost, trouble-free boiler operation, especially in high pressure, high temperature units. With a Riley TURBO FURNACE this objective is obtained . . . and . . . WITHOUT using costly auxiliary methods for distributing furnace gases.

In the TURBO FURNACE all fossil fuels — gas, oil, coal — are burned at the base of the furnace with combustion extending evenly from sidewall to sidewall. The cutaway illustration shows combustion gases rising within the furnace envelope in a uniform wall to wall column resulting in a minimum variation of metal skin temperatures across the full width of both the superheater and the reheater. The maximum variations above normal operating temperatures are well within safe alloy limits assuring long tube life.

Because of natural, uniform furnace gas flow and distribution steam temperature control is also simplified, furnace slagging is minimized — deslagging equipment is rarely required. Flyash and air pollution problems are minimized. Higher heat releases and wider single undivided furnaces are possible.

The advanced design of the TURBO FURNACE represents an important step forward toward more efficient boiler operation. Because any available fuel can be burned at any time without major alterations the TURBO FURNACE boiler is the ideal "Convertible" furnace for today's and tomorrow's fuel economics.

A new graphically illustrated TURBO FURNACE catalog is available. Ask your Riley Representative.

Some Typical Riley Turbo Furnace Boiler Installations.

Delaware Power & Light Co.
Delaware City Power Station
3 Units — 500,000 lbs/hr each
1425 psig — 950F Fuel — Fluid Coke

Texas Electric Service Co.
Permian Basin Steam Elec. Station
1 Unit — 825,000 lbs/hr
1750 psig — 1005/1005F
Fuels — Gas, Oil, Future Coal

Dallas Power & Light Co.
Northlake Steam Elec. Station
2 Units — 1,200,000 lbs/hr each
2125 psig — 1005/1005F
Fuels — Gas, Oil, Future Coal

Louisiana Power & Light Co.
Sterlington Steam Elec. Station
1,550,000 lbs/hr
2125 psig — 1005/1005F
Fuels — Gas, Future Oil, Coal

Louisiana Power & Light Co.
Little Gypsy Steam Elec. Station
1,650,000 lbs/hr
2125 psig — 1005/1005F
Fuels — Gas, Oil

Florida Power Corporation
Turner — Unit No. 4
600,000 lbs/hr
1750 psig — 1000/1000F
Fuels — Gas, Oil

New Orleans Public Service Co.
Michoud — Unit No. 3
1,550,000 lbs/hr
2325 psig — 1005/1005F
Fuels — Gas, Oil, Future Coal

Manila Electric Co.
Rockwell Station — Units 6, 7
430,000 lbs/hr each
2160 psig — 1005/1005F
Fuel — Oil

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WHAT HAPPENS WHEN A NATION SPENDS MORE ON GAMBLING THAN IT SPENDS FOR HIGHER EDUCATION?

If you can find any Romans around, ask them. They lived pretty high on the hog in their day. That is, until some serious-minded neighbors from up North moved in. The rest is ancient history.

You'd think their fate would have taught us a lesson.

Yet today we Americans spend twenty billion dollars a year for legalized gambling, while we spend a niggardly four-and-a-half billion for higher education. Think of it! Over four times as much! We also spend six-and-a-half billion dollars a year for tobacco, nine billion dollars for alcoholic beverages, and billions more on other non-essentials.

Can't we read the handwriting on the wall?

Our very survival depends on the ability of our colleges and universities to continue to turn out thinking men and women. Yet today many of these fine institutions are hard put to make ends meet. Faculty salaries, generally, are so low that qualified teachers are leaving the campus in alarming numbers for better-paying jobs elsewhere.

In the face of this frightening trend, experts estimate that by 1970 college applications will have doubled.

If we are to keep our place among the leading nations of the world, we must do something about this grim situation before it is too late. The tuition usually paid by a college student covers less than half the actual cost of his education. The balance must somehow be made up by the institution. To meet this deficit even the most heavily endowed colleges and universities have to depend upon the generosity of alumni and public spirited citizens. In other words, they depend upon *you*.

For the sake of our country and our children, won't you do your part? Support the college of your choice *today*. Help it to prepare to meet the challenge of tomorrow. The rewards will be greater than you think.

It's important for you to know what the impending college crisis means to you. Write for a free booklet to HIGHER EDUCATION, Box 36, Times Square Station, New York 36, New York.

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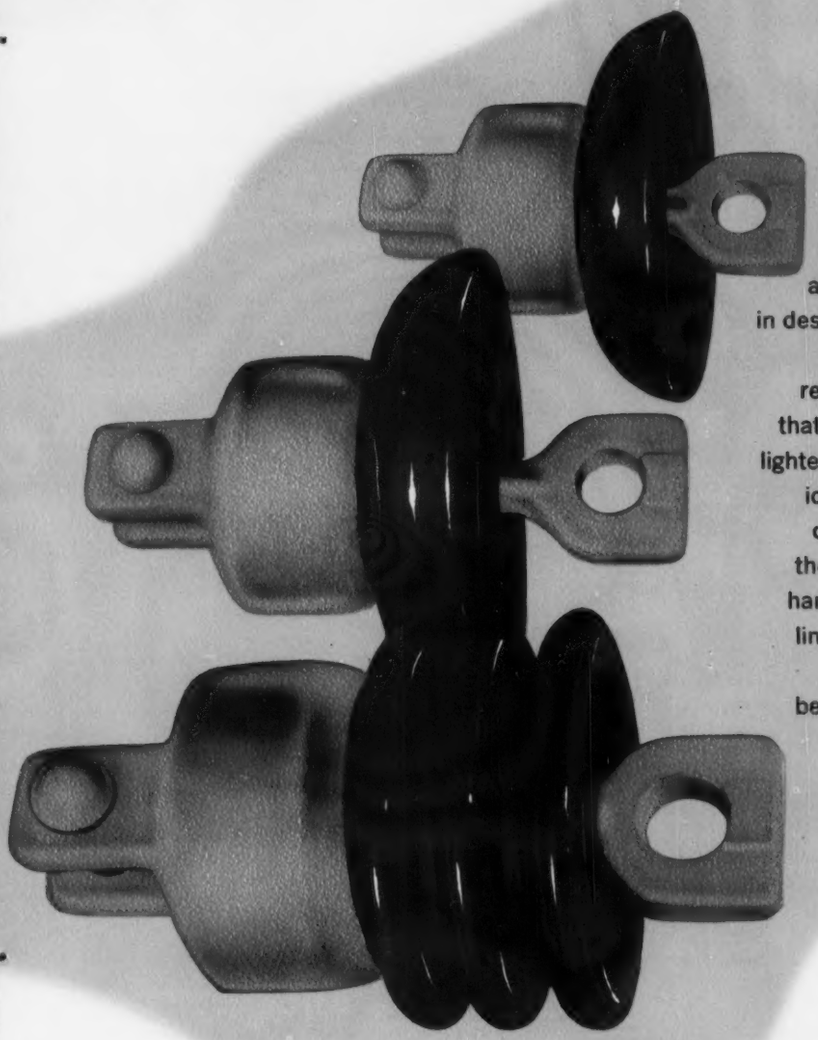


Mean fewer pounds to handle... longer life

Here's the new look in distribution deadend insulators... Chance Insulators with aluminum caps and studs. New in design. News because they're the first insulators with corrosion-resistant all-aluminum hardware that makes them as much as 30% lighter than standard insulators and ideal for all types of distribution deadend installations. Because they are lighter, they're easier to handle and install... simplify the lineman's job when he's hanging two or more insulators. And, because the aluminum hardware is highly resistant to all weather and industrial corrosion factors, they have a longer service life. Your Chance Man has the full story. Get it. Then, use these new Chance Insulators for better distribution line construction.

the first insulators with ALL-ALUMINUM hardware for savings on weight and resistance to corrosion

ABC INDUSTRIES

A. B. CHANCE CO.

CENTRALIA, MISSOURI

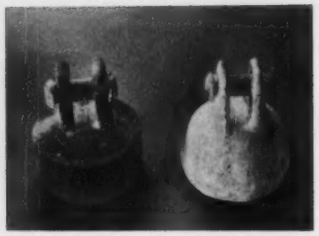
A. B. Chance Co. of Canada, Ltd., Toronto

TO HELP YOU

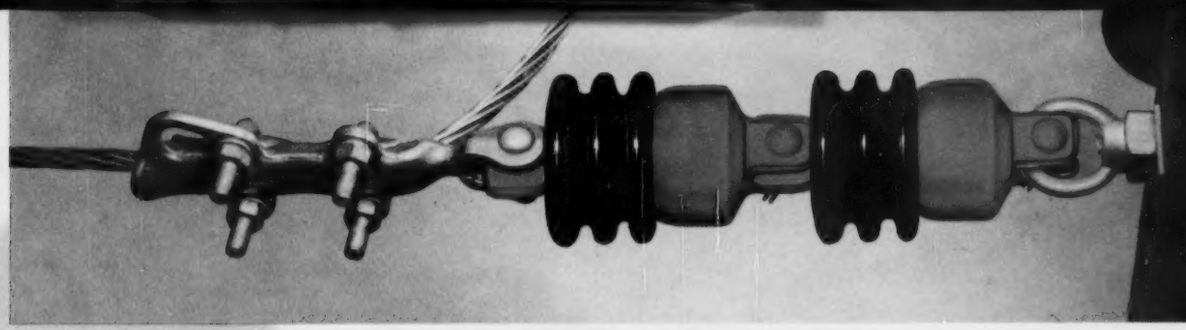
BREAK THE POUND BARRIER

HERE'S WHAT THE CHANCE MAN HAS IN HIS LUNCH BOX

*HAROLD ELLIOT
CHANCE PRODUCT MGR. INSULATORS

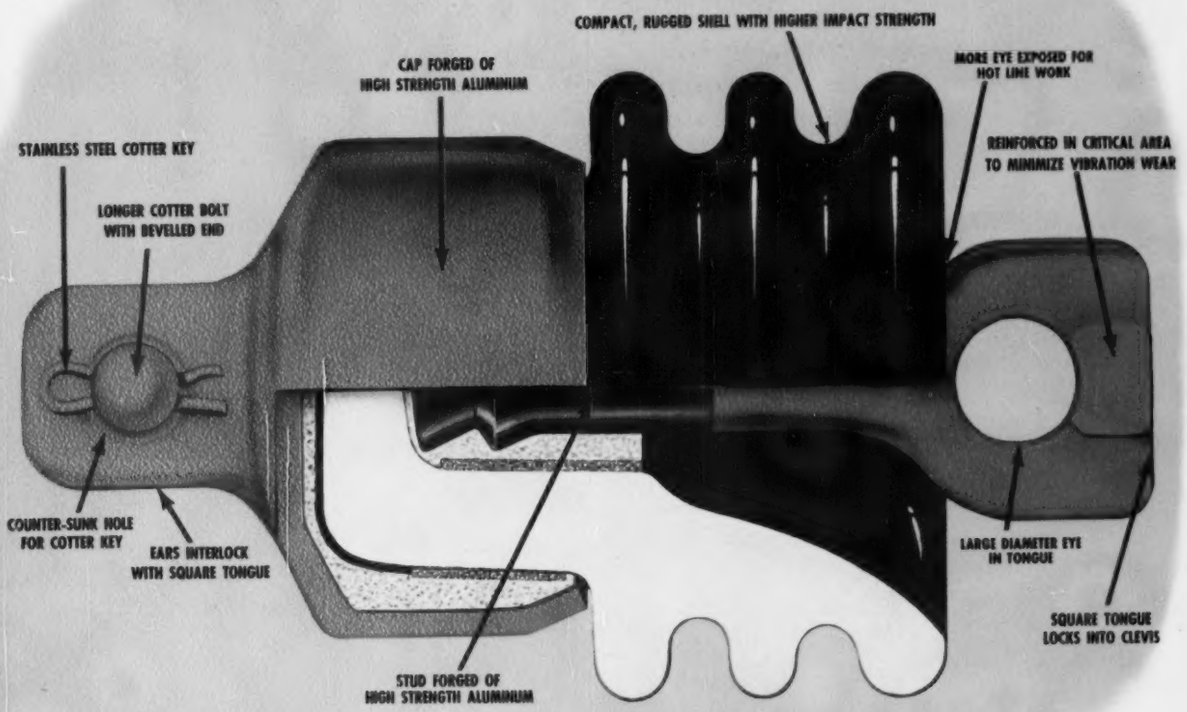


500 hour salt fog tests had little effect on aluminum cap, on the left, while ferrous cap, on the right, is badly corroded and damaged after the same amount of exposure.



SLIM-LITE Insulator units can be handled easily without breaking because the square tongue in the clevis keeps units apart.

NEW CHANCE SLIM-LITE DISTRIBUTION DEADEND INSULATOR WITH ALL-ALUMINUM HARDWARE


COMPACT, RUGGED SHELL WITH HIGHER IMPACT STRENGTH
CAP FORGED OF HIGH STRENGTH ALUMINUM
MORE EYE EXPOSED FOR HOT LINE WORK
STAINLESS STEEL COTTER KEY
REINFORCED IN CRITICAL AREA TO MINIMIZE VIBRATION WEAR
LONGER COTTER BOLT WITH BEVELLED END
COUNTER-SUNK HOLE FOR COTTER KEY
EARS INTERLOCK WITH SQUARE TONGUE
LARGE DIAMETER EYE IN TONGUE
SQUARE TONGUE LOCKS INTO CLEVIS
STUD FORGED OF HIGH STRENGTH ALUMINUM

SHELL DESIGN HAS 35% GREATER PUNCTURE VALUE

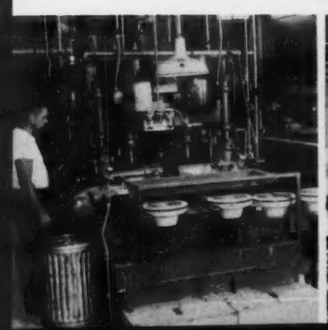
Less Weight...Longer Life

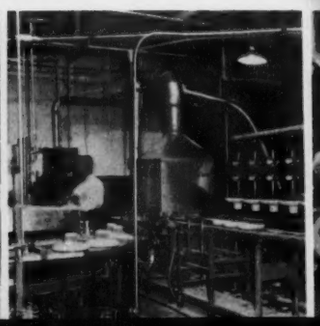
You get these operating advantages:

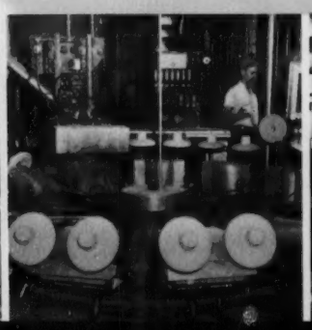
- **30% reduction in weight for handling ease**
  Use of a forged aluminum cap and stud breaks the insulation "pound" barrier . . . makes this new insulator more than 1½ pounds lighter than a standard 6-inch disc. Simplifies the lineman's job when he's hanging two or more insulators.
- **Longer service life in highly corrosive areas**
  The aluminum hardware is highly resistant to all weather and industrial corrosion factors. Salt fog tests prove this. The insulator's "fog-type" construction makes it possible to use this one type for all distribution deadend installations.
- **Greater impact strength, higher puncture values**
  The rugged design of the insulator shell, along with the compression glaze and improved manufacturing techniques, gives this insulator a higher mechanical impact rating, and a puncture voltage rating of 35% higher than a standard 6-inch disc.
- **Slim contour gives better appearance to lines**
  This handsome, slim, compact insulator improves the appearance of distribution construction, an important factor in residential areas.
- **Easier to work with hot line tools**
  The insulator's shape gives linemen more clearance for working with hot line tools. And, such features as a longer cotter bolt with beveled ends, a countersunk hole for the cotter key, a large diameter eye in the tongue, and more eye exposed, make the lineman's task easier.
- **More adaptable to cover-up equipment**
  The insulator's compact design simplifies covering with most any type of cover-up equipment.
- **Prevents breakage of insulator during construction**
  The square tongue keeps units from falling together and breaking porcelain. This feature, plus the light weight, makes them easy to handle and reduces breakage in storage or in transit.
- **Completely tested for electrical and mechanical characteristics**
  The merits of this new design have been test-proved. Tests include fault current testing under tension, steep wave front and standard impulse tests, time load tests, and all other electrical and mechanical tests necessary to prove the performance of the SLIM-LITE Insulator.

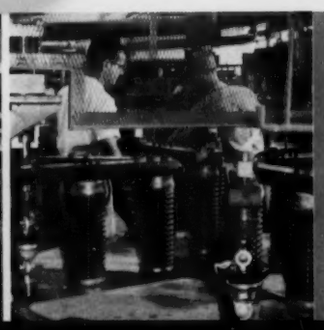
A. B. CHANCE CO.
CENTRALIA, MISSOURI
A. B. Chance Co. of Canada, Ltd., Toronto

C160-19









Watch for more to come from the new Chance insulator production line

ANACONDA®
WIRE AND CABLE
COMPANY

presents an Integrated Approach to EHV cable technology

Research
Development
Manufacturing
Accessories

Anaconda's Integrated Approach to EHV systems is a unique union of research, development and manufacture of both cables and accessories. Because each of the Anaconda divisions involved in these activities is located in the same area and concerned with the same problems at the same time, the result is a completely coordinated entity.

This Integrated Approach creates complete EHV systems which will perform predictably under usual and unusual conditions.

The methods of achieving that goal are shown on the following pages.

→

RESEARCH: oil chemistry

Insulating oil is a complex mixture; years of research have failed to fully characterize all its components, or unravel the chemistry of its aging process.

Five years ago, Anaconda began to assemble an unprecedented research team to meet this challenge. The task force included not only our own research laboratories but also top independent consultants and the leading producers and refiners of specialty insulating oils.

Along the way we developed valuable new research techniques which will be standard in the industry's laboratories for years to come: the first known high-voltage variable-frequency measuring bridge; an improved apparatus and procedure for investigating high-stress gassing properties of oils; a revolutionary new continuous power-factor monitoring instrument.

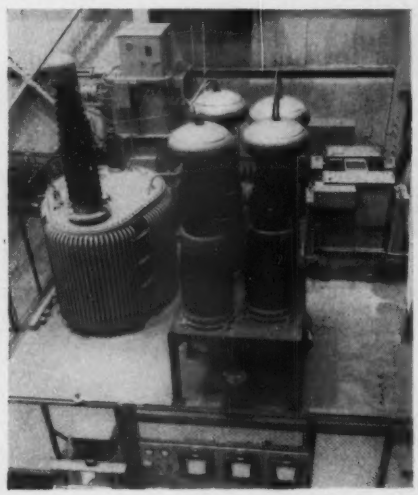
FOLLOWING OIL DETERIORATION by continuous power factor monitoring on Anaconda's new research instrument.

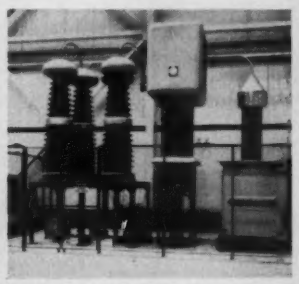
The result: a major breakthrough in elucidating the mechanism of deterioration in insulating oils. (It's a series of chain reactions starting with hydroperoxides and proceeding by an ionic—not a free radical—mechanism.*)

DEVELOPMENT: cyclic aging

Development is only meaningful when you can tell how you are doing. In cable, *only full-scale, long-term cyclic aging* tells the story. In Anaconda's new development laboratory, the world's finest cyclic-load aging set gives the answers for today's cables and tomorrow's improvements. Change paper density? Add chemical inhibitors to oil? Redesign joint contours? Only cyclic-load aging really tells.

At Anaconda, conductor heating is induced by circulating conductor current. It's as simple—and as authen-





D-C RECTIFIER EQUIPMENT for cyclic-load test. Center: 5,000-ampere rectifier on 300-kv insulating pedestals; right: 300-kv isolating transformer; left: 380-kv terminals on cable in tunnel.

WEST HALF OF TUNNEL under laboratory floor, showing four 345-kv cables on cyclic-load test.

A-C VOLTAGE EQUIPMENT for cyclic-load test. Left rear: 2,400-kva tunable reactor; right rear: 13.2-kv 360-kva voltage regulator; left center: 300-kv 2,400-kva main transformer; center: 380-kv terminals on cables in tunnel; left front: control console for reactor; front center: panels for power factor and temperature recorders.

*"*The Chemistry of Cable-Oil Deterioration," "The Gassing Properties of Low-Viscosity Cable Oils," and "The Electrical Stability of Insulating Oils," by George Feick, Walter F. Olds (Arthur D. Little, Inc.), and Edward D. Eich, Anaconda Wire & Cable Co., and "The Interpretation of Power Factor-Stress Curves," by Edward D. Eich.*

tic—as that. There are no external heat sources, no added thermal insulation, no end effects, no complicated high-resistance conductors.

America's first series-resonant high voltage supply powers the test unit. This is a pure voltage source. Gone are those regulator harmonics that can give misleading results in conventional sets. Long lengths can now be tested. Tests are carried to failure but the self-limiting energy of series resonance *protects* valuable evidence.

Incredible power can be simulated — more than adequate for testing any conceivable EHV system. Voltage can climb to $525/\sqrt{3}$ kv. Current to 6,000 amperes. All this adds up to 5500 *mva,* larger than Con Edison's peak load.

The significance: Truly informative tests on the real thing—over an extended period. For example, 345 kv cables, continuously on test since 1958, are now successfully carrying the equivalent of 1,375,000 kva at 460,000 volts.

There is no substitute for this kind of testing which duplicates in-service conditions.

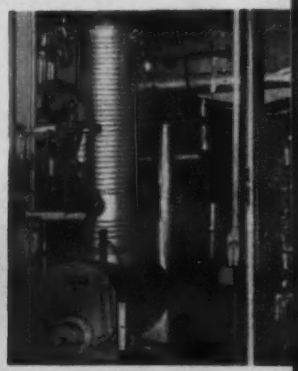
MANUFACTURING: dryness

Anaconda's new impregnating equipment and procedure have already produced greatly improved insulation dryness. Direct conductor heating supplies plentiful heat to vaporize absorbed water in the paper—there is no choking off of drying by inadequate heat transfer from tank jackets. The largest impregnating tanks in the world are also the tightest; their advanced design embodies new approaches to vacuum vessel design.

Cryogenic pumping multiplies vacuum pump speed many times over—makes practical a new level of complete evacuation. Giant oil jet diffusion pumps actually crack the micron barrier on Anaconda's huge tanks—removes 99.999955% of air and moisture!

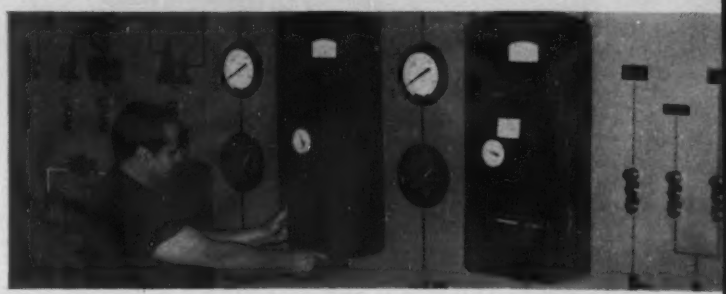
Electronically amplified radiation gauges guard this process—advanced instrumentation, providing permanent records of every minute in the processing of every foot of cable.

The results: The world's driest pipe cable. This superior dryness means high ionization levels, lowest dielectric losses, greater dielectric strength, much increased cable life under heaviest loads.



HIGH-SPEED VACUUM PUMP removes 99.999955% of air and moisture in tank.

WORLD'S LARGEST IMPREGNATING TANK being tested for high impregnating pressure.



VACUUM GAUGE, connected to the vacuum guard circuit on the impregnating tanks, maintains continuous foolproof check on vessel pressure.

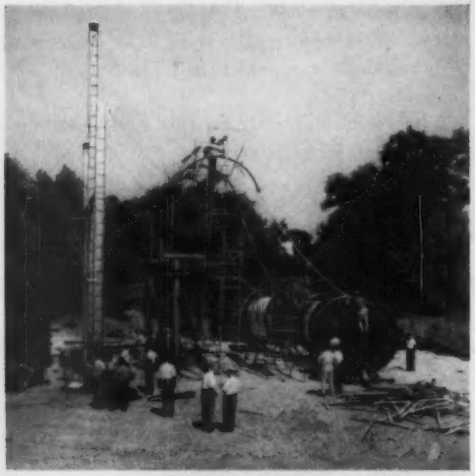
ANACONDA®

There's more about Anaconda's Integrated Approach on the next page . . .

Integration of Anaconda's facilities has led logically to the coordination of accessories and cable designs. Anaconda uses the same engineering teams to research, develop and use-test accessories as well as cable. As a result, accessory and cable characteristics match precisely. The advantage is clear: no weak links in the system.

∫ ACCESSORIES: system integrity

This coordinated effort has another customer benefit —special system problems can be considered when the accessories are designed without affecting overall system efficiency. For example:



CABLE PULL through a pre-assembled termination unit on a 138-kv high-pressure oil-filled pipe-type cable system.

One customer needed a semi-stop joint that would not only locate faults and isolate any pressure-loss in HPOF pipe-type cable, but would also let the cable move longitudinally without disrupting the seal or crushing the insulation. Anaconda met both requirements with a flexible barrier design that also matched cable characteristics perfectly.

In another typical case, a customer desired a pre-assembled termination unit that would provide controlled bending and fast sealing of pipe-type cable during the difficult pull to the first manhole. Furthermore, the customer's operating requirements would not permit welding either during or after the pull. Anaconda answered the problem with a "drop-casing" terminal assembly that proved to be a unique solution.

These examples won't necessarily parallel your own requirements, but they do demonstrate Anaconda's capacity to develop specialized accessories that meet the requirements of the customer and the cable equally well.

SEMI-STOP JOINT on 138-kv high-pressure oil-filled pipe-type cable system with Anaconda flexible barrier. Anaconda Field Adviser is shown making final check of dimensions before the joint is closed.

We've just described Anaconda's Integrated Approach to EHV cable technology—but you'll appreciate its advantages even more if, the next time you're faced with a problem in EHV cable systems, you "see the man from Anaconda".

ANACONDA®
WIRE AND CABLE COMPANY
25 Broadway, New York 4, N. Y.

60225

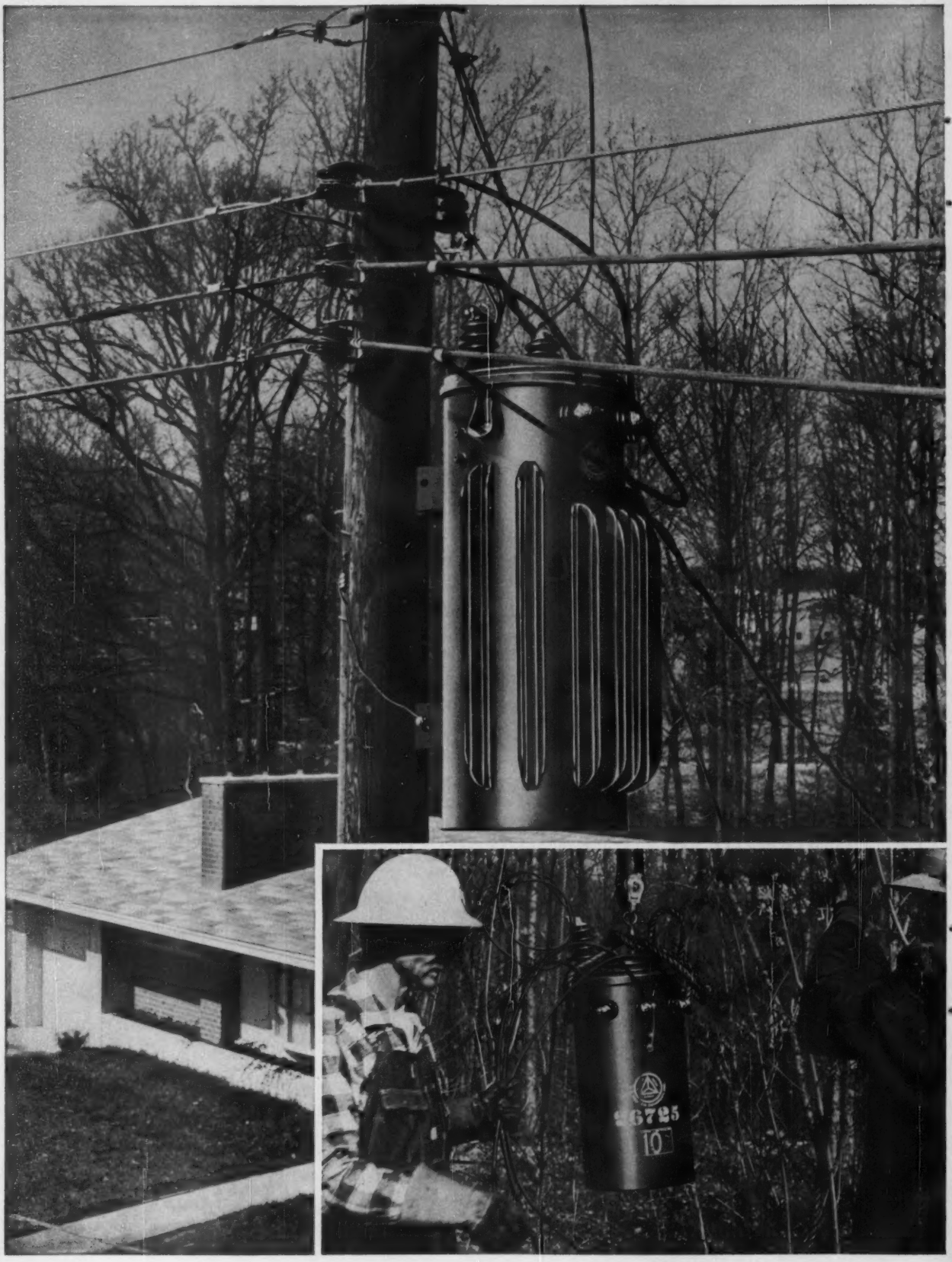
Tube sheets of Everdur-1010 improve tube welding in condenser of Consolidated Edison Astoria No. 4 Unit

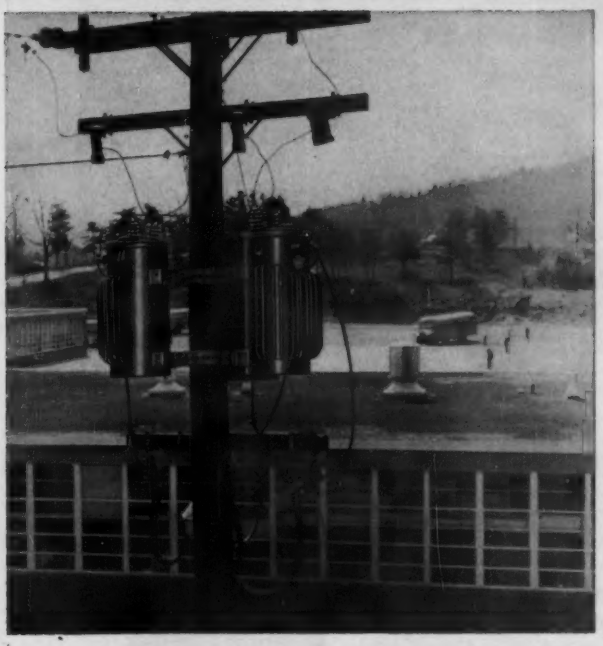
Good weldability of Everdur-1010, Anaconda copper-silicon alloy, improved the welding of tubes to tube sheets in the main condenser of Consolidated Edison's 340,000-kw Astoria No. 4 Unit. There are four inlet and four outlet tube sheets of Everdur®, each 14′ ¾″ long x 8′ wide x 1½″ thick, holding the 24,000 condenser tubes of aluminum brass. Tube ends were welded in with the inert-gas tungsten arc process using automatic equipment. One of the most versatile of Anaconda's alloys, Everdur-1010 offers not only good weldability, but also good resistance to corrosion, high strength, high resistance to fatigue—and is available in large rolled tube plates. For more information on Everdur alloys, write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 6172

ANACONDA®

TUBES AND PLATES FOR CONDENSERS AND HEAT EXCHANGERS

Made by The American Brass Company





Up goes another new Delta-Star Distribution Transformer to help Appalachian serve its customers better. Wherever they're used, these transformers are satisfying the toughest service demands... at shopping plazas, schools, residential areas, industrial and commercial districts.

Delta-Star Transformers are Going Up all over the Appalachian System

Each year, more and more Delta-Star transformers are being installed by the Appalachian Power Company, which has headquarters in Roanoke, Va. They are servicing homes, schools and business districts. Wherever the location, the exceptional performance of Delta-Star transformers has more than measured up to all service demands.

Today, a growing number of progressive companies like Appalachian Power are using the heavy duty Delta-Star transformers to meet exacting service requirements under all types of weather conditions. Evidence of this is the increasing number of Delta-Star transformers that dot streets and roads throughout America.

When you need transformers, be sure to check into the Delta-Star line. For the latest illustrated catalogue write to: *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois.*

DELTA-STAR ELECTRIC DIVISION

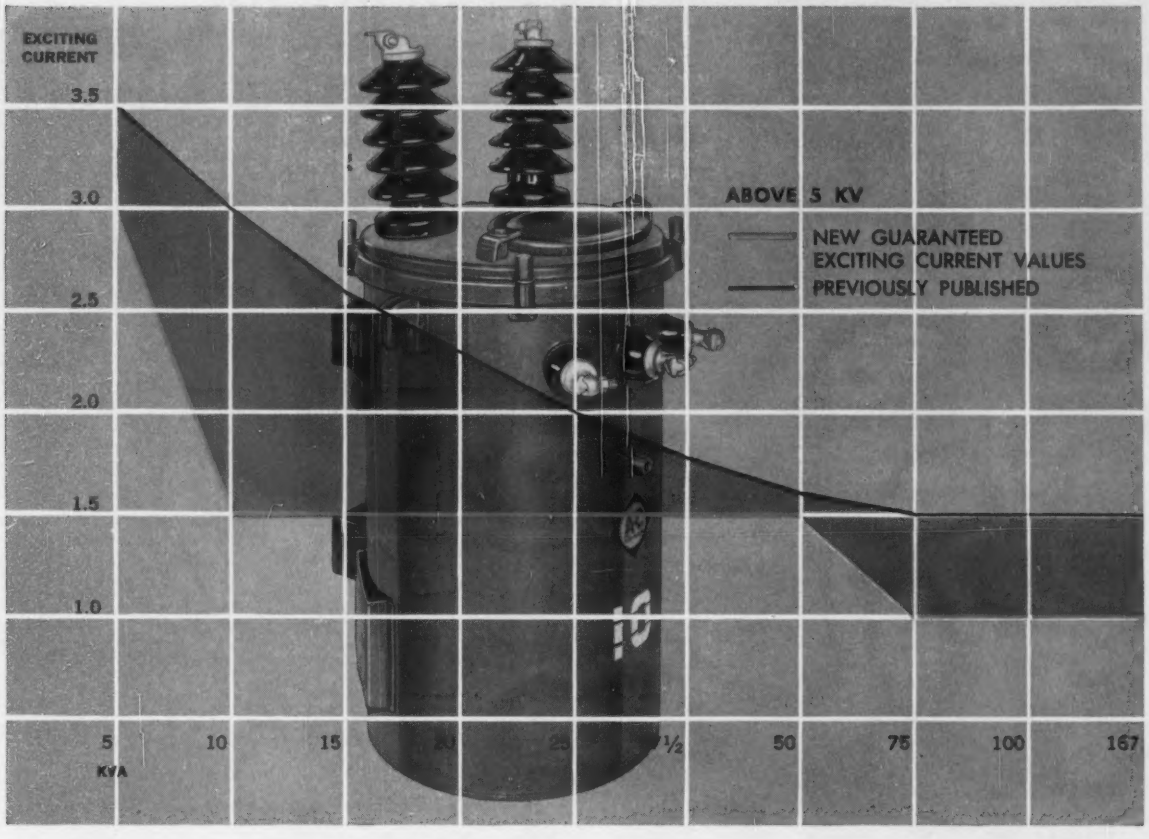
PORTER

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

ALLIS-CHALMERS

A-1254



Close the gap on revenue losses

with Allis-Chalmers distribution transformers

Exciting current cut as much as 50%! That's the dramatic Allis-Chalmers story proved by the curves above. Multiply this reduction by the number of similar distribution transformers on your system. **Then specify Allis-Chalmers . . . and profit these four ways:**

1. Generating capacity requirements are cut. Only minimum amounts of nonrevenue-producing exciting current are needed.

2. Lower exciting currents help reduce copper loss on your transmission lines.

3. Your system carries a higher amount of revenue-producing power.

4. You reduce the need for system power-factor corrective equipment.

These new exciting current values are *guaranteed* by Allis-Chalmers. They're available to you in all distribution transformers up to 167 kva . . . in all voltage classes. Allis-Chalmers extra revenue-getting power is a result of a continuing redesign program. Engineers team their ingenuity and skills with digital computers . . . rejecting and selecting new values to create the optimum in balanced transformer design.

For all the facts fast, contact your nearby A-C representative or write ***Allis-Chalmers,*** *Power Equipment Division, Milwaukee 1, Wisconsin.*

Industry's most rigid quality-control program assures you of top transformer performance.

Editorial Comment

AUGUST 29, 1960

Yankee Ingenuity Is Still in Style

The fourth EUM Report of 1960 depicts man's ingenuity as he works. Whether planning a job, or actually doing the job, electrical utility people across the country are accepting the challenge to find the "one-best-way" to do their jobs.

The "one-best-way" is the safest, easiest, quickest, and the most economical way to do the desired job. Transmission-line ice-up disrupting service? Develop a sleet warning device! Dust, sweaty hands, or numb fingers fouling up relay test schedules? Build a mobile test lab! Linemen's "climbers" breaking without warning? Test all "climbers" for microscopic cracks! V-braces and other hardware messing your storeroom routines? Then design special palletized containers!

The EUM descriptions reported in this issue may or may not fit your particular job problems. However, direct pertinence to your own job is not important. The points demonstrated throughout this report are that the unorthodox approach need not be confined to trip-to-the-moon projects—we should allow our inherent ingenuity freedom of expression if we are going to find the "one-best-way" to do the job. Although a particular solution to a job-problem may initially appear radical it may be the "one-best-way" to finish the job on schedule, prevent service disruption, and cut service costs.

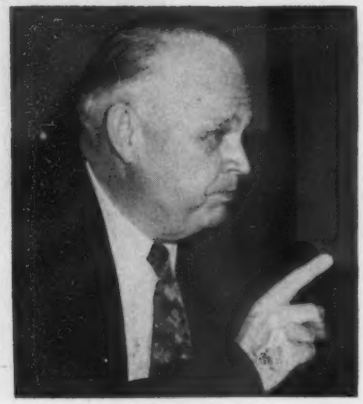
Majorities Have No Place Here

In an attempt to improve what he considers outmoded regulation laws, Robert S. Webb, chairman of the Indiana Public Service Commission, has recommended to a legislative subcommittee that the three-man commission consist of at least two attorneys. He also proposes that commissioners be full-time employees with staggered terms.

While his recommendations sound as if they would be an improvement over the existing arrangement, Webb should take warning that a majority of any limited profession or interest has its hazards. It does not match the broad responsibilities of a regulatory commission, which of course is to safeguard the public interest.

At the present time commissioners work part time. There is a "public counselor" who represents the public before the Commission, and Webb is recommending that this office be eliminated and that the Commission have a "chief attorney." Webb calls the present procedure "the socialized practice of law." With a two-lawyer majority and a chief attorney, he might find that the Commission would again be engaging in the "practice of law," which is certainly not synonymous with objective regulations.

We suggest that Indiana's Commission not have a majority of any kind, but instead that it set its sights on men who are known to have the ability to keep the broad meaning of "in the public interest" before them. The experts, including legal, could be hired for the expanded staff that Webb is also recommending.



KERR: Heads Water Committee

Kerr Committee Told

- **USBR report says $22 billion will be needed by 2000 AD**
- **Federal reclamation projects in East foreseen. Seaton says expansion into new states now being discussed**
- **Trend toward bigger storage and more pumping facilities prophesied as river basins are more fully developed**
- **Use of sea water and trans-basin diversions not expected before end of this century**

Federal and state reclamation bodies will develop another 6,280 Mw of hydro power capacity in the US in the next 40 years, according to the Bureau of Reclamation report recently submitted to the special Senate Water Resources Committee.

This prediction is based on an expected $22-billion expenditure for reclamation projects between now and the year 2000. Although the report is based partially on conjecture, it brings some interesting points to light:

- About 75% of all potential federal hydro power sites will be developed by the year 2000. And about 90% of the probable non-federal hydro power sites will be developed by then.
- Little shift from the present type of reclamation project is expected until after 2000, although there will be a trend toward bigger storage facilities and more pumping plants for new projects, as the various river basins reach their ultimates in comprehensive development.
- Expansion of federal reclamation activities into the East is expected, although the Bureau has no estimate on what or where the possible projects would be located outside of the present 17 Western "reclamation states."
- Increasing reliance on pumping plants for new reclamation projects will require huge amounts of power.

Sen Robert S. Kerr (D-Okla.), chairman of the Senate committee, will use the Bureau's report, along with a number of others, to document this important final report on the nation's water availability and requirements during the next 40 years. This report will be wrapped up and released before Congress re-convenes next January.

Kerr May Urge Bigger Program

The Kerr report is expected to push strongly for a stepped-up program of large reclamation projects suited only for federal development—including a number of projects with hydro power potential.

Generating capacity to be added in the 17 Western states by federal agencies—Bureau of Reclamation, Bonneville Power Administration, Corps of Engineers, Southwestern Power Administration—they should total about 4,223 Mw by the year 2000, out of a hydro power potential of 5,460 Mw at sites adaptable to federal development.

By drainage basins, this anticipated federal power capacity would be built as follows (hydro power potential in parenthesis): Colorado River Basin, 1,763 Mw (2,350 Mw); Central Pacific, 1,065 Mw (1,350 Mw); Pacific Northwest, 750 Mw (990 Mw); Missouri River Basin, 254 Mw (330 Mw); Gulf Basin, 142 Mw (155 Mw); Great Basin, 125 Mw (160 Mw); Arkansas-White-Red Basin, 124 Mw (125 Mw).

The California state water plan would add another 2,057 Mw out of a potential 2,740 Mw capacity in its area.

Some of these federal projects (Trinity Dam, Calif.; Glen Canyon Dam, Ariz.) already are under construction; other federal projects (Yellowtail Dam, Mont.-Wyo.) are authorized; but most of the proposed projects are just possibilities, ranging from the Fryingpan-Arkansas Project, Colo., to the huge Texas Gulf Coast diversion scheme.

The total cost of all potential reclamation projects—federal and non-federal—in the Western states would be about $30 billion by 1959 prices, the Bureau estimates, but only about $22 billion would be needed, or could be termed "possible and not unreasonable," by 2000 A.D.

Of the $22 billion, about $12 billion will be federal reclamation projects; $8 billion, the California state water plan; and $1.4 billion, other non-federal projects.

No power projects would be built by other state or local reclamation groups. Their share of projects is small, because almost all of the ground-water gravity-type water projects have been developed.

See 46 Power Projects in West

As of now, the Bureau envisions an ultimate reclamation development in the West involving 1,085 new projects—650 to be built by the federal government and 46 containing power generation. Most of the non-federal projects will be relatively small. Many of these projects won't be built in the next 40 years, but enough will be to add an estimated 17 million acres of new land equivalent for cultivation, and to store about 175 million acre-ft of water.

Several much-discussed plans to push reclamation activities into new areas are still in the nebulous stage;

Dams Will Add 6,280 Mw in 40 Years

these probably won't come into their own until after the year 2000. They are: (1) Use of sea water by means of saline water conversion plants—still costly and in the developmental stage; (2) Construction of huge, trans-basin water diversion projects. The Fryingpan-Arkansas Project is a small-scale example of this, but the biggest development appears to be in the Pacific Northwest, where water could be diverted from the Columbia River to the Missouri and Great Basins.

No Eastern Projects for 10 Years

Interior Secretary Fred Seaton predicts that the trend toward pushing federal reclamation law into the Eastern states "will surely continue." He adds that for the next 10 years or so, most of the irrigation projects in the East will be individually-financed, but "the time will come when more elaborate, project-type facilities will be required and in demand."

Seaton said the possibility of extending reclamation law into new states is "even now being discussed," but he side-tracked any further comments on where or how the reclamation program should be extended "until such time as the federal government becomes involved" in such plans.

Speed-up Tied to Population

The projected need for $22 billion in new reclamation construction is impressive when contrasted to the $4 billion that has been spent in the US between 1902 and 1959. Of course, rising costs will account for part of this differential, but the Bureau of Reclamation also says the future water projects will have to be built at a rate 2.5 times as fast as in the 1950's. This is to keep up with the mushrooming population growth in the West. Actually, $1.2 billion of the anticipated $12 billion in needed federal reclamation projects is currently under construction.

Completion of this $22-billion reclamation "program" would approach "full practical development of intra-basin water supplies . . . plus the in-basin water transfer projects contemplated [north-south canal] in the California plan."

Seaton's report to the Senate admits that only 20% of its proposed projects have had feasibility data run on them—25% have undergone some study, another 25% are only "rough estimates," and the final 30% are purely "judgment."

Assistant Reclamation Commissioner N. B. Bennett, however, foresees the day when economic feasibility (benefit-cost-ratios) won't mean too much as to whether a reclamation project is needed. As the US population grows, as available farm lands are put into use, the need to develop still more lands through irrigation may become so pressing that technical feasibility alone may become controlling.

Major Projects Listed

Some of the major projects proposed by the Bureau, by drainage basin, are these (authorized or under construction indicated):

Missouri Basin—the unauthorized $700-million to $1-billion Garrison Diversion Project, consisting of a dam (other than Garrison Dam), canals and pumps. Also included are the Yellowtail, Hardin, Ainsworth, Farwell and Oahe, Jefferson, Cedar Rapids, Glen Elder, Kanapolis and Nebraska-Midstate irrigation projects, all of which are authorized.

Colorado Basin — Reclamation includes the Upper Colorado projects now under construction (Flaming Gorge, Glen Canyon, Navajo Dams), plus a number of unauthorized projects: Animas-La Plata, Bostwick Park, Dolores, Opal, Sublette, and perhaps 50 to 100 more small Colorado River storage participating projects.

Great Basin—several projects under construction (Weber Basin and Washoe irrigation projects) plus the authorized Central Utah project and the unauthorized Woodruff Cokerville Project.

East Side Diversion Included

Central Pacific—extensions to the federal Central Valley project, including the Trinity Dam now under construction; the authorized San Luis project and the unauthorized East Side division. This is independent of the $8-billion proposed California state water plan—for which bonds will be voted on this fall—although some federal assistance is probable.

Rio Grande-Pecos Basin—the unauthorized San Juan-Chama project.

Arkansas-White-Red Basin—the Washita Irrigation Project, under construction; the authorized Norman Water Storage Project, plus the unauthorized Western Gulf and part of the Fryingpan-Arkansas Projects.

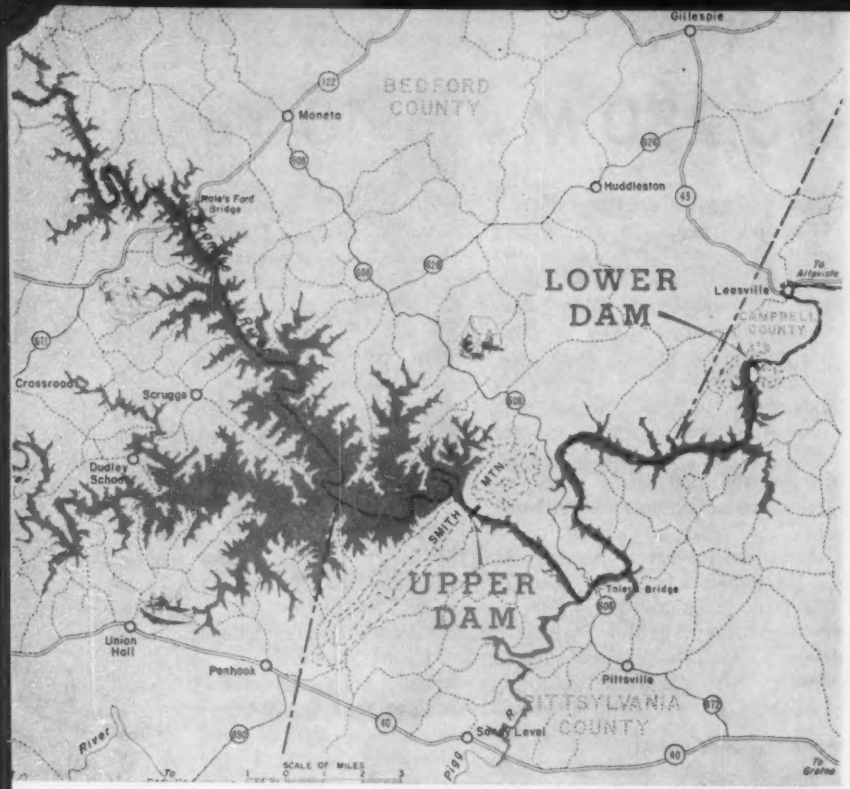
Pacific Northwest—a series of unauthorized irrigation projects including Bruneau, Salmon Falls, Monmouth-Dallas, Main-Weiser, and Horse Heaven Projects—mostly small dams, canals and pumping plants—and the Mountain Home-Garden Valley Project.

CEI Fights Shopping Center Sub-Metering

Cleveland Electric Illuminating Co and a major Cleveland shopping center have temporarily recessed a legal battle in which CEI is attempting to prevent extension of sub-metered service. Shoregate, the shopping center, was granted an order restraining CEI from disconnecting service, but it posted a $10,000 bond to indemnify the Illuminating Co against any losses incurred as a result of the sub-metering.

A CEI application to the Public Utilities Commission of Ohio to terminate all sub-metering according to a scheduled plan is pending. Hearings on the application will be held in October.

The 60-store shopping center is one of a number in greater Cleveland providing sub-metered service. CEI's proposal would prohibit future installations and phase out existing sub-metering over a period of time.



Contract Let on Pumped Storage Project

A construction contract for the lower of two dams in one of the largest pumped storage projects in the US has been let to S. J. Groves & Sons Co by Appalachian Power Co. The project, the Smith Mountain station on the Roanoke River in western Virginia, will have a 440-Mw firm capacity and cost an estimated $50 million. It is reportedly the largest hydro installation in the US involving combined river flow and pumped storage.

The lower or Leesville Dam is about 18 miles downstream from the upper dam at Smith Mountain Gap. Unlike the concrete arch dam at Smith Mountain Gap, the Leesville Dam will be a concrete gravity type, 920 ft long and 90 ft high from river bed to crest. The entire development is expected to be in operation in 1963.

The upper dam will have two 150,100-kw turbines and also two 66,025-kw turbines. The two smaller units will be reversible, to function as pumps. Each will have a capacity of 4,100 cu ft of water per second. Provisions are included for an additional 150,100-kw turbine. The lower dam will have two 23,750-kw vertical shaft turbines.

In operation, water from the 1,100,000-acre-ft upper reservoir will move through the turbines on the upper dam. Some will continue through the lower dam, but most will be stored until off-peak periods in the 110,000-acre-ft lower reservoir, when the pump turbines, driven by power from coal-fired plants, will pump it back into the upper reservoir.

Forest Fire Blacks Out 15,000 Sq Miles in Western Nevada

San Francisco—An uncontrollable forest fire last week severed the only four power lines serving northwestern Nevada and the Lake Tahoe region of California, and blacked out for 30 hours a 15,000-sq-mile area served by Sierra Pacific Power Co. Included in the outage were the entire cities of Reno, Winnemucca and the Nevada state capital, Carson City.

Two 60-kv and one 120-kv lines share one right-of-way down the eastern slope of the Sierras. A second 120-kv line runs parallel at distances varying from ¾ to 5 miles way. Fire virtually obliterated an area including about 2,000 ft of all four lines.

An official estimated about 100,000 kw of capacity was lost when the power lines burned out.

A wind shift cleared smoke and flames from the area through which the lines are strung and crews raced in to make temporary repairs. They found no breaks in the wires, but discovered a number of downed poles. Five poles were jacked back into position, and in some places the power line was guyed to what remained of nearby trees to keep it off the ground.

Tests indicated the repaired lines would work, and Pacific Gas & Electric Co, from whom Sierra Pacific purchases power at wholesale, was instructed to switch on the power at midnight, Monday, Aug. 22. But officials feared another wind shift could bring the flames back to the temporarily repaired lines.

Meanwhile, crews dashed to make permanent repairs on some sections of the separate 120-kv line, which was not fully inspected because of smoke and heat in the area. Power was then switched over this line, permitting permanent repairs on the other lines.

SEC-Middle South Hearings Set

Lawyers for Middle South Utilities, Inc, and the Securities & Exchange Commission will square off Sept. 27 on the question of whether to allow electric utilities holding companies to issue stock options to officers and key employees.

The commission has set Sept. 27 as the date to begin oral arguments on the matter. From advance indications, the session could turn into a real fight.

The dispute began earlier this year when Middle South applied to the SEC for permission to set aside 120,000 shares of the company's stock, currently valued at around $3 million, for stock options to the utility's officers and key employees. Middle South contends that issuance of the options is necessary to attract and retain high-caliber management people.

Ever since its inception the SEC has frowned on issuance of options for regulated holding companies and has privately dissuaded several firms from making such requests.

When Middle South applied formally for a ruling on the matter, the SEC staff attorneys argued that stock options serve neither the best interests of the company nor stockholders.

In preliminary skirmishing, the attorneys for each side have filed briefs, cross briefs, and answering replies laced with comments reflecting upon the wisdom and legal soundness of the adversaries.

Middle South, for instance, in one brief commented that the "Chamber of stock option horrors presented in the proposed findings of the [SEC] staff must be recognized as a vastly overdrawn caricature, even by the most vehement opponents of stock options."

Middle South has lined up other firms to give the flavor of an industry-wide fight. Ohio Edison Co and The Southern Co both have filed briefs with the commission supporting Middle South.

Southern Co lawyers charged that acceptance by the commission of its attorneys' views would "stultify not only its own actions in other areas but also congressional actions."

SEC attorneys in a reply brief were quick to pound on an apparent tripup by the utilities' lawyers. The industry had argued that the Senate Small Business Committee earlier this year had approved a measure that the utilities interpreted as favorable to holding company stock option plans. The industry argued this was the latest expression of the congressional will that such options are legal and beneficial.

The SEC staff reported that the industry lawyers apparently were not keeping up to date and that this proved "devastating" for their point of view. The staff noted that the Senate Committee provisions were rejected by Congress in a measure that passed early in June and was signed by Pres Eisenhower.

"Thus, the slender reed of the report of the Senate Select Committee upon which Middle South relies has snapped," the SEC staff argues. "The division wonders whether Middle South . . . will now be consistent and urge that the Congress has condemned stock options as a matter of congressional policy."

The nub of the argument in the case before the SEC turns on the interpretation of the commission's power to refuse to allow stock options. There is no express provision in the law against stock options. But the position SEC maintains is that Congress inherently gave it the power to do so.

Middle South is making a test case of the matter before the SEC. The commission previously had relied on private persuasion to dissuade several holding companies issuing stock options. But the Middle South case will mark the first formal ruling.

New Application Boosts Nez Perce Size

Kennewick, Wash.—The Washington Public Power Supply System announced Aug. 20 that it is filing a revised application with the Federal Power Commission for its proposed Nez Perce Dam on the Snake River, 47 miles upstream from Lewiston, Ida.

The revision would increase height of the dam by 20 ft to 700 ft and increase the initial power installation from six generators to ten, with a capacity of 2,100 Mw. It would make the dam the largest multi-purpose hydroelectric project in the Western Hemisphere, said Owen Hurd, managing director of the Power Supply System.

The revised application would increase cost of the project to $348.5 million, including $28 million for fish passage facilities. It would increase storage capacity to 6,600,000 acre-ft.

The 2,100-Mw initial capacity, compared to Grand Coulee's 1,944, would be increased to 3,400 with the eventual installation of six more turbines.

The Washington Public Power Supply System, a group of 15 Washington PUDs, is making a strong bid to secure fisheries support in its revised application. Its plans call for a full-river-width fish attraction system, the first of its kind, as well as conventional fish ladders and newer pressure locks, for fish going upstream. Fingerlings bound downstream would be collected on three tributary rivers, barged along the reservoir to the dam and transported to the river below the Nez Perce Dam by means of a unique helical chute.

The dam would back water more than 63 miles upstream on the Salmon River, 61 miles on the Snake River and about 10 miles on the Imnaha River.

Yankee Plant Goes Critical

Yankee Atomic Electric Co's 134-Mw nuclear power plant near Rowe, Mass., achieved criticality at 8:19 pm, August 19. Operating initially at 110-Mw, the plant will begin full-power operation this year.

Operation of Yankee is expected to provide important technical and economic data towards achieving economic nuclear power.

First Joint River Basin Meeting Urged

Five inter-agency groups ponder future role as some members urge stronger stand on controversial issues

Greater participation by states in river basin development was urged by principal speakers at the first joint meeting of the nation's inter-agency river basin committees.

Delegates from 30 states attended the Aug. 19 conference at the University of Colorado in Boulder. They represented the Northeastern Resources Committee, the Columbia Basin, Missouri Basin, Pacific Southwest, and Arkansas-White-Red Basins inter-agency committees.

The meeting concluded with the 150 delegates expressing by voice approval of a suggestion by Leonard B. Dworsky of the Columbia Basin group that "the record show that the sense of the meeting is that the inter-agency committees should hold sessions such as this annually." The meeting was called with the objective of improving government coordination of water and related land resources developments.

Water Waste Called Criminal

Gov Steve McNichols of Colorado, chairman of the National Governor's Conference, set the tone of the conference when he declared the states' financial role in water development has been skimpy "and in the future we're going to have to put more chips in the game." McNichols, a Democrat, said states are going to have to lead in the prevention of waste of water "which is criminal."

Elmer B. Staats, deputy director of the Bureau of the Budget, said a major problem is "the need to improve the arrangements for state participation in the whole process of investigation, study, planning and development of water resources. The states have a tremendous stake in the direction that natural resources developments take within their boundaries."

Specific recommendations for strengthening state participation in the inter-agency committees were presented by Earl Coe, director of the Washington State Department of Conservation.

Coe noted that "most active participation [on inter-agency committees] has fallen to the federal agency representatives, largely by default on the part of the states."

Coe proposed these recommendations for expanding state participation:

(1) Naming of state representatives to subcommittee chairmanships wherever possible.

(2) Assignment of task force duties to state representatives on an equal basis with federal agency personnel.

(3) Appointment of a state representative as co-chairman of each inter-agency committee. (Only federal officials are chairmen now.)

He said, "All of the Columbia Basin states are expanding their activities in water resource development. None, to my knowledge, will be reluctant to increase their participation in inter-agency responsibilities."

Forrest Nelson, Oklahoma governor's representative on the Arkansas-White-Red Basins Inter-Agency Committee, told the meeting, "The states should assume a sizable share of the responsibility for keeping local interests informed of the operational considerations and the functional limitations of individual projects. Such work should be undertaken in cooperation with the sponsoring federal agency and should extend to the enactment of special state regulatory legislation (such as land-use regulation) where joint state-federal considerations deem it appropriate."

Aandahl Cautions Columbia Group

The effectiveness or lack of effectiveness of the inter-agency committees was reviewed at a panel discussion. Some speakers, including two from the Columbia Basin, favored the committees stepping into controversial areas.

At this point, Fred G. Aandahl, assistant secretary of Interior, interjected what he called a "word of caution." He said the Columbia Basin Inter-Agency Committee (CBIAC) "has been the most aggressive" in trying to bring action by inter-agency committees into areas of controversy. "That is probably because of the situation there (Columbia Basin) where there are two major areas of controversy. One is the use of water for fish and wildlife purposes as opposed to hydroelectric power and second whether there shall be private or public development of hydroelectric power.

"I don't know how far the inter-agency committees can go," he continued, "but we will have to feel our way along. We're suggesting that you be careful and not go so far as to disrupt your agency."

Action on Controversies Urged

Coe told the panel, "The states desire that the CBIAC take a strong position on some of the controversial questions that affect the region in water resources . . . We believe it is the function of the inter-agency committee to offer its best recommendations and provide leadership to the region on even the most controversial subjects. To do so, at times, may run contrary to policies of the various federal agencies as set in Washington, D.C."

Brig Gen Allen F. Clark Jr, division engineer for the North Pacific Division of the Corps of Engineer who serves on CBIAC, said some members of CBIAC felt that even though their agency headquarters had adopted a specific position "it did not preclude full and frank discussion of that particular controversy at the field level. Yet there was a reluctance on the part of others to even discuss matters of a controversial nature on which their departments in Washington has taken a position."

Clark said he felt there was "a field here for improvement, without in any way compromising the member, which would broaden the committee's role as a regional policy group—a sounding board for public discussions of issues. More work needs to be done along this line to explain ideas and means."

to Boost State Aid

Lewis A. Stanley, state engineer for Oregon, complained of the reluctance of inter-agency committees to enter areas of controversy and asserted, "There is a void here—there is no agency to speak for the Columbia region" on controversial issues.

Earlier, in formal addresses, Aandahl and Harrell F. Mosbaugh, chairman, Interior Missouri Basin Field Committee, noted editorial references to the inter-agency committees as being ineffective "toothless tigers."

Aandahl added, "Perhaps, however, this calm of quiet functioning is a tower of strength. Fundamental to this consideration is a continuing awareness that some of the limitations are essentially inherent in our federal system with its not always clearly defined, but very basic, division of responsibilities and functions between state and national governments."

The most pertinent question, Aandahl said, "is how far the basin committee with its complex of membership should go in developing independent self-serving recommendations. The federal members must act as representatives of the federal government which, by definition, must take the national rather than the regional point of view. There is no doubt in my mind that the state representatives are equally obligated to uphold the policies and the budgets of their respective state governments. The expression of contrary opinions by subordinates, even though acting as members of a committee, would constitute irresponsible action."

'Toothless Tiger' Tag Denied

Mosbaugh said that "although the Missouri Basin Inter-Agency Committee has been described by various individuals and the press as being ineffective, unable to make binding decisions, unwilling to consider controversial issues, a publicity medium, and a toothless tiger, I believe it has been very effective. This is a voluntary organization. Therefore, accomplishments and effectiveness stem from the desires and efforts of individual members to coordinate and execute numerous interrelated programs in accordance with authority vested in the respective states and federal agencies."

Staats told the conference that it will take "the careful and imaginative effort of all levels of government and of private interests" to make "the best use of the financial resources available for the development and use of our water and land resources."

He added: "The major problems we in the federal establishment face are these:

"First, the large number of agencies with responsibilities or interests in water resources projects. There are now four federal departments with major nationwide operating responsibilities for water resources programs—Army; Agriculture; Interior; and Health, Education and Welfare. . . .

Three Agencies Do Similar Work

"Second, the broadened scope of agency missions. As a result of efforts to put into practice the sound principles of multiple-purpose, comprehensive development, we now have three major federal agencies—Corps of Engineers, Bureau of Reclamation and Soil Conservation Service—empowered by law to do in many cases much the same work. . . .

"Third, the different laws, policies and procedures under which agencies operate. . . .

"Fourth, the need to improve the arrangements for state participation in the whole process of investigation, study, planning and development of water resources."

Edwin C. Johnson, retired US senator and former governor of Colorado, cautioned the meeting against becoming too concerned with organization and procedural matters. "Thoughtful organization is an emphatic must," Johnson said, "but organization for the sake of organization constitutes a grave menace. I fear that inter-agency committees are slipping into that trap. What we do here could become a 'delaying tactic' which the urgency of the situation cannot tolerate."

Johnson said during a panel discussion that "inter-agency committees won't become effective until some way is devised for them to reach the ears of Congress, the Bureau of the Budget and other agencies. The committees, made up of federal men subject to control of their departments in Washington, are too far removed—they are not getting close enough to the powers that be."

AANDAHL: Don't disrupt the agency

Sylvan C. Martin, regional engineer for Public Health Service at New York City, told the panel that the Northeastern Resources Committee differs from the other inter-agency committees in that the NRC has been organized with the aim of developing federal and state participation on an equal level.

N. Y. May Join Group

"In order to preserve full equality," Martin said, "the NRC has been founded on a compact between the six states affected and the federal government. Through this compact we will apportion costs in direct relation to the population and size of the states. Our first goal is $100,000 annually with $50,000 provided by the states and $50,000 by the federal government. These funds will be used for investigations and studies of our natural resource problems." Martin said the NRC is aiming for "a full and complete partnership without reservation."

The six participating New England states are Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont. New York is now considering becoming a member.

Transformer Loading Revised to

PG&E adopts interim practices based on higher maximum distribution transformer loadings, ambient temperatures

O. L. HILL, Electrical Engineer, Pacific Gas & Electric Co, San Francisco

A new loading policy, adopted by Pacific Gas & Electric Co, is expected to reduce expenditures for distribution transformers as much as $10 million over the next five years. Maximum transformer loading for various load factors and ambient temperatures, as limited by insulation temperatures, has been raised to the values in Table I.

The PG&E transformer loading standard was previously based on the ASA "Guide for Loading Oil Immersed Distribution and Power Transformers" which uses 95C as the maximum normal operating temperature of the hot spot. But substantial improvements have been made in insulation materials since the 95C standard was adopted 40 years ago. Anticipating that several years would pass before the present simulated-life tests, made under AIEE sponsorship, could bring revision of the ASA standard, PG&E decided not to wait.

Allowable loading of distribution transformers is now limited by three factors: Deterioration of insulation from excessive temperatures with time as a factor; high annual cost from excessive load losses; and, subnormal customer voltage from excessive voltage drop in the transformer. But before an interim revision of loading practice could be established, it was necessary to review the economic and voltage limitations.

Where the load was a single, concentrated one with no secondary mains involved, the problem was simple. For 12-kv transformers in 10 to 50-kva sizes, the calculated economic limits were:

Annual LF	Range of Economic Load Limit
30%	225 to 295% of rating
90%	175 to 220% of rating

Serving a concentrated load permits the entire allowable secondary-system voltage drop to take place in the transformer. For 12-kv transformers in 10 to 50-kva sizes and 85 to 96% load power factor, a 6-v limit (120-v base) permits transformer loads of 200 to 285% of nameplate rating.

Where the transformer serves distributed load along a secondary main, the transformer and secondary must be analyzed together as a system for a determination of economic and voltage limitations. The multitude of repetitive calculations dictated the use of a digital computer. A program was written for the IBM 705 based on the hypothetical system in Table 1, using the Print 1 automatic coding system. The secondary system, typical of those in local subdivisions, is composed of banked transformers, 120-ft spans, and four customers per pole. Services were not included. Variables were:

- Transformer size: 10, 15, 25, 37.5, and 50 kva
- Transformer spacing: Two to ten spans inclusive
- Transformer load limits (% of nameplate): For summer peak areas, 120, 140, 160%; For winter peak areas, 140, 160, 180 and 200%
- Secondary size: 1/0, 3/0, 266 MCM all-aluminum conductors
- Loads per customer (coincident kw peak demand): 1, 1.5, 2, 3, 4, and 5
- Power factor: Summer peak areas, 85%; Winter peak areas, 96%
- Secondary capacitor, as needed to improve voltage and/or reduce transformer loading.

Assumptions were:

- Number of customers per pole, four
- Poles spaced at 120-ft intervals
- Primary system 12 kv, three wire
- Transformer, self-protected, without taps and lightning arresters
- Maximum voltage drop of transformer and secondary main, 6 v.

Costs included were:

- Transformer investment
- Excess investment for secondary hot legs larger than 1/0 all-aluminum
- Transformer iron losses
- Transformer copper losses
- Secondary losses
- Secondary capacitor costs in excess of primary capacitor costs.

Reflects Load Growth

Load growth was taken into account by using level annual costs of losses based on 2% annual growth over a ten-year period to reach the design loads and a 6% interest rate. It was the company's experience that in developed areas, such as a subdivision where each lot is occupied, the growth rate is low. Only with redevelopment of the area to multiple dwellings, commercial buildings, etc., or introduction of a new appliance, such as the clothes dryer, does the growth rate become larger.

Two power factors were used, one for summer peak areas and one for winter peak areas. The PG&E service area includes 94,000 sq miles in central and northern California. The interior valley area has a pronounced summer peak in residential areas due to evaporative-type coolers, air conditioners, heat and water pumps. In the coastal regions, where the climate is mild, this equipment is almost nonexistent, and the annual peak is a high-power-factor winter one.

Table I—Maximum Transformer Loadings

Daily Load Factor, % (Peak Day)	Maximum Peak Load (% of Nameplate) Summer Interior Area	Summer Coastal Area	Winter All Areas
0–60	125	135	160
61–100	120	130	145

Save $10 Million in Five Years

No-tap 12-kv transformer costs were used, as most new subdivisions are thus served. (Distribution at 4 kv generally has been contained within established areas for years.) Since 12-kv primary distribution is three wire, all transformers must be rated for full line-to-line voltage. A earlier study resulted in the policy of using no-tap transformers. Lightning arresters are not used with distribution transformers in most areas due to the very low incidence (less than three days per year) of thunderstorms.

Secondary conductor considered was limited to bare all-aluminum on crossarm construction. Mild weather conditions permit use of this economical construction in most service areas. Minor exceptions are ACSR mountainous regions because of snow loading, and copper along the coast because of salt-spray corrosion problems.

Where total secondary system voltage drop exceeded the limit used, the computer determined the amount of secondary capacitors needed, along with their appropriate costs. The program automatically included secondary-capacitor costs when capacitors are required to reduce load on the transformer within a specified limit.

Temperature Limits Loading

The three most economical combinations determined for each load density in the study are in Table II. With the exception of the three cases indicated by asterisks (*), transformer loading in these economical combinations is higher than the limitations recommended on a temperature basis. In general, therefore, temperature limitations govern loading of transformers supplying distributed as well as concentrated loads.

The variation in secondary conductors and other components in Table II is to be expected, as the component costs used are increased in relatively large steps. Even the cost of losses increases in steps as the transformer spacing is increased an additional span. In general, however, the larger loads per customer tend toward larger conductor and larger transformers. Considering the difficulty of accurately predicting loads and variations of lot sizes within a subdivision, it appears that a selection of any one of the three combinations may result in the most economical solution for a particular case.

Table II shows that it is desirable to be conservative in the selection of secondary conductor size, as the consequence of overestimating the load may be more costly than underestimating it. For instance, if the load in a new subdivision in a winter peak area is estimated to be 2 kw per home at the end of ten years with a 2% growth rate, the secondary size should be 1/0 all-aluminum with 25-kva transformers at intervals of five spans. If the maximum load to materialize is 1 kw per home, the transformers could be at eight-span intervals, and the combination would remain economical. Should the load develop to 5 kw per customer, it could still be economically served with 1/0 all-aluminum by using 37.5-kva transformers at three-span intervals.

(*Continued on page 69*)

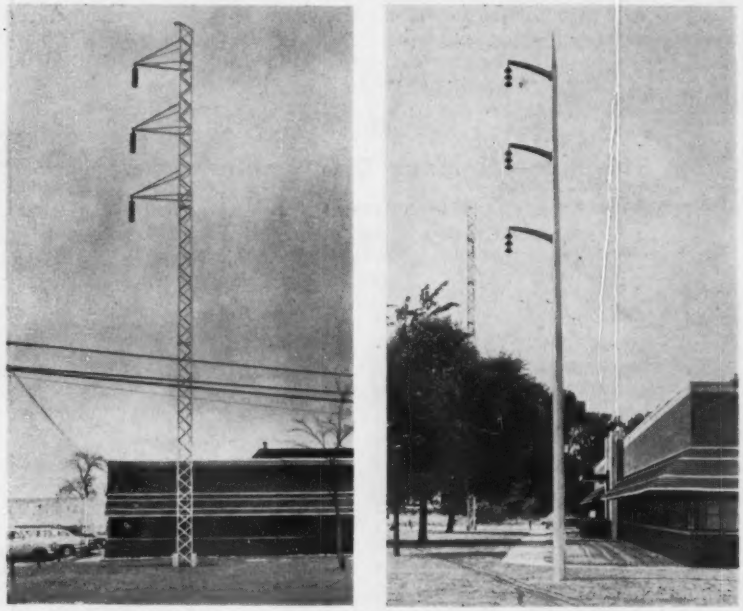
Table II—Minimum Cost Combinations

Kw/Pole	Sec. Cond. Size (AA)	Transf. Spacing (Spans)	Transf. Size	Transf. Per Unit Load	Sec. Cap. Req'd. (Kva)	Relative Cost/Kw
Winter Peak Load Areas-96% Load Power Factor						
4	1/0	8	25	1.32*	1.2	$21.75
4	1/0	6	15	1.67	0.0	21.86
4	1/0	7	15	1.87	6.0	22.50
6	1/0	6	25	1.50*	0.1	$19.46
6	1/0	7	25	1.68	9.9	20.74
6	1/0	4	15	1.67	0.0	21.47
8	1/0	5	25	1.66	0.5	$18.13
8	3/0	6	25	1.95	5.8	18.83
8	3/0	5	25	1.67	0.0	18.96
12	3/0	4	25	2.00	0.0	$16.64
12	3/0	5	37.5	1.67	0.0	17.17
12	1/0	4	25	1.94	6.6	17.55
16	1/0	3	25	2.00	0.0	$15.75
16	3/0	4	37.5	1.78	0.0	16.08
16	3/0	3	25	2.00	0.0	16.13
20	266 MCM	4	50	1.67	0.0	$15.89
20	1/0	3	37.5	1.67	0.0	16.00
20	3/0	3	37.5	1.67	0.0	16.14
Summer Peak Load Areas-85% Load Power Factor						
4	1/0	7	25	1.30*	0.7	$24.27
4	1/0	8	25	1.35	9.4	25.00
4	1/0	5	15	1.57	0.0	25.44
6	1/0	5	25	1.41	0.0	$22.45†
6	1/0	5	25	1.40	0.6	22.60†
6	1/0	6	25	1.52	10.0	22.85
8	1/0	4	25	1.51	0.0	$21.23
8	3/0	4	25	1.51	0.0	22.28
8	3/0	6	37.5	1.42	6.7	22.29
12	3/0	4	37.5	1.51	0.0	$20.02
12	1/0	3	25	1.60	4.9	20.56
12	1/0	4	37.5	1.42	6.4	20.74
16	1/0	3	37.5	1.51	0.0	$19.16
16	3/0	3	37.5	1.51	0.0	19.44
16	3/0	4	50	1.42	9.2	19.70
20	3/0	3	50	1.41	0.0	$18.61†
20	266 MCM	4	75	1.25	0.7	18.68
20	3/0	3	50	1.40	1.1	18.77†

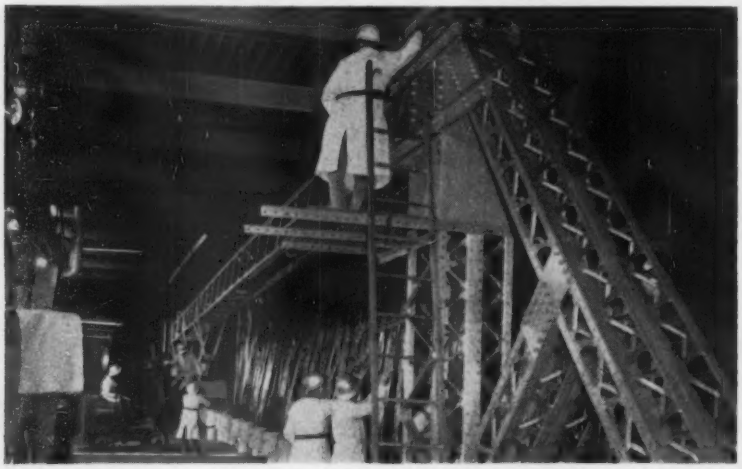
† Identical except for capacitors to meet loading limit

Attractive Aluminum Masts Withstand

Two varieties of aluminum transmission pole, both designed for use on Louisiana Power & Light Co 69-kv lines, can withstand 140-mph winds. Tests conducted at Line Material Industries' Alrectic Div, Jackson, Mich., proved that the structures would stand up when subjected to hurricane-force winds. One structure is an aluminum alloy latticed mast 24 in. square and 85 ft high, and the other, also 85 ft high, is octagonal aluminum with a 24-in. base and a taper to the top.



ALUMINUM MASTS of two different designs will withstand 140-mph winds. Both present a pleasing appearance and may be used in thickly-settled areas



LATTICED MAST was supported at one end and weights and tensions were applied at points to simulate various wind loads on tower and conductors

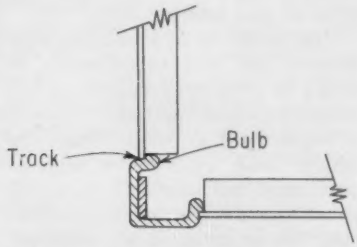
The latticed design features a "bulb" at the edge of the angle members to provide added strength at this point. Tests had previously shown that failure of aluminum alloy members occurred at the edges of the angles. A track was also incorporated in the bulb along the edge of the angle to facilitate fabrication. With the track arrangement the lacing can be welded entirely from the outside. Without the track design it is necessary to weld the lacing from both inside and outside.

The design cuts fabrication costs, gives a strong weld and reduces the heat-affected area. The additional metal in the bulb along the edge of the angle takes heat away from the weld faster to prevent annealing.

The mast was given a directional design, with maximum strength in the direction of maximum load. The section modulus of the mast varies every eight feet.

Four tests were conducted, representing loading with winds of 80, 110, 125 and 140 mph. The third test represented a check of strength required by NEMA standards. Maximum deflection was 79.5 in. at the point of attachment of the static wire in the 140-mph test. Net deflection at the same point in the first test, representing the loading of an 80-mph wind, was 28.75 in. Deflection at this point in the second test was 54.5 in., and in the third test it was 67.5 in.

The octagonal pole was designed, as a result of a proposal by H. E. Deloney of Louisiana Power & Light Co, to be attractive enough to be acceptable on the streets in ur-



BULB at edge of angle adds much to strength but little to structure weight

140-Mph Winds

ban areas. It will also be available in lengths ranging from 35 to 50 ft.

The lower portions of the pole are reinforced with members inside the pole that give it greater strength in the transverse direction than in the longitudinal direction. Added strength is provided in the longitudinal direction by welding strips of aluminum on the inside face of the pole wall.

Reinforcement of the upper sections of the pole, where less strength is required, is made by welding the strips of aluminum to the inside faces of four sides of the pole. At this point the taper of the octagonal shape used in the lower part of the pole results in a square shape at the top of the pole.

Poles are made of extrusion shapes having chord angles. Edges of the chord angles are enlarged with a bulb of aluminum which:

1. Strengthens the edge for an added safety factor.

2. Provides a longitudinal groove into which adjacent panels are welded.

3. Permits an exceptionally strong weld.

4. Carries away the heat of welding, reducing the heat effect of welding to a minimum.

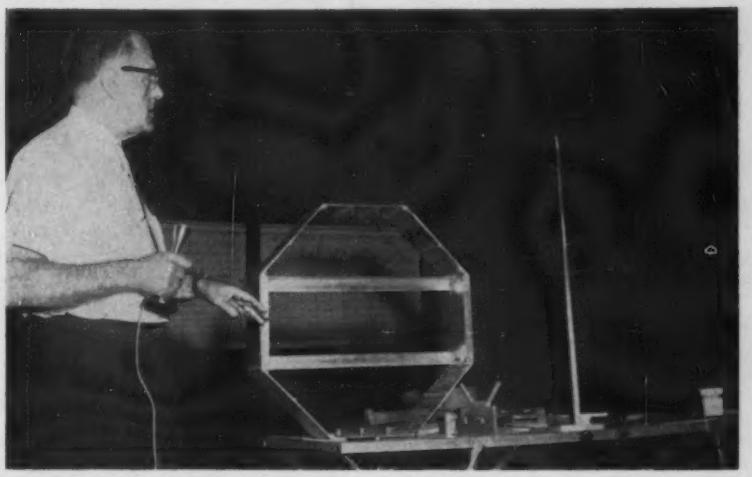
In the testing, the pole was supported at the base and in a horizontal position. Weights were suspended from the points of attachment of the shield wire and the phase conductors to simulate wind loading on the conductors. Weight of the pole was sufficient to represent wind loading on the pole itself. A set of pulleys was set up to exert a pull toward the base of the pole equivalent to conductor weight.

Successful tests were made at three different loadings:

1. Twenty pounds times 1½ times the projected area, or approximately 110-mph wind velocity.

2. Twenty-five pounds times 1½ times the projected area, or approximately 125-mph wind velocity.

3. Thirty pounds times 1½ times the projected area, or approximately 140-mph wind velocity.



REINFORCING MEMBERS, which are installed in the lower pole section, are explained by Harold E. Handley of Line Material Industries' Alrectic Div

WEIGHTS WERE APPLIED at conductor attachment points to simulate wind loading. This set of weights is used to simulate 80-mph wind loading in the first test

85-FT OCTAGONAL POLE was tested in the same manner as latticed aluminum pole. Here weights represent wind forces for a wind of 140-mph strength

How Snowy Mountains Project . . .

Uses 330-Kv Cable for Getaway

Seven 330-kv oil-filled cables in Australia's Snowy Mountains carry the output of four 80-Mw generators from underground transformers 1,500 ft to overhead lines in the open air above. The single-phase high-voltage cables—six for service and a spare—are part of Snowy Mountains Hydro-Electric Authority's $1-billion development in New South Wales and are installed at the Authority's T-1 power station.

This entire power plant is underground. The cables rise through a 200-ft difference of level in a cable tunnel, most of it at a 1:8 slope but steepening to 2:3 at the end, to connect to transmission lines above. They emerge over the Tumut River Valley, whose precipitous banks made it impractical to bring the transmission towers down to the cable-tunnel portal. So the cables span the river on a steel arch bridge, 186 ft long, to reach their terminations in a cable yard on the opposite bank. From this point, overhead transmission lines lead three miles to a switching station.

Initial exploration of underground rock conditions showed it was better to terminate the cables directly at the transformers through cable boxes built onto the single-phase transformers instead of terminating them in air with potheads. Cable work began with the transformer terminals to minimize the oil head under which the cable had to be cut and a temporary plug inserted. The crew made a loop of excess cable containing about twice the length used in the termination. Thus in the event of a terminal failure, there is enough cable for making a new terminal. Preformed jigs were used to profile the loop correctly.

The cable terminations were assembled in a horizontal plane immediately above the cable boxes into which they were installed vertically. Each cable end was held in a special jig that withstood the end thrust while the cable armor and sheath were stripped back, the stress cones made, and wrapped paper insulation applied. The end, plumbed off, was joined to its mounting flange, which, as installed, is insulated from the supporting structure. With tackles supported from a special lifting bracket, the end was lowered into a porcelain shell inside the cable box on the transformer. The special bracket allowed the outer wall of the cylindrical cable box to be separately supported, complete with its elephantide barriers.

Cable Troughs Laid

The cable end was filled under vacuum with degasified cable oil. Elephantide discs were sewn across the ends of the cylindrical barriers to reinforce the gap under oil between the cable end and the bushing through the transformer tank during the cable acceptance test. The cable box was thoroughly circulated under high vacuum with degasified transformer oil.

The cable tunnel floor and the cable yard were laid with reinforced concrete precast into U and L-shaped sections, as shown, so as to form seven cable troughs on 12-in. centers. Precast cover slabs placed over all but one of the troughs form a working floor.

The cables were covered with six in. of sand tamped well around and above the cables. On the steeper slopes, a concrete barrier was cast around each cable at intervals of 20 ft to anchor the cable and prevent migration of sand. On the 1:8 slope, a barrier of a cleat and sand was placed each 100 ft. Otherwise the cables were buried without restraint beyond sand packing.

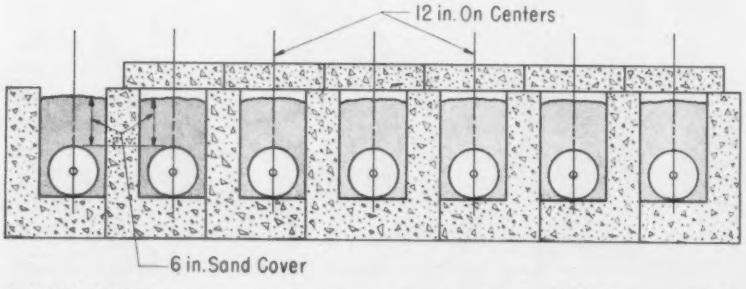
Cable Given Sine Wave

Appreciable seepage in the tunnel is allowed to penetrate around the loose-fitting trough covers to the sand to improve the thermal conductivity of the sand cover. However, the thermal conductivity of the completely dry sand is adequate for the designed maximum conductor temperature of 65C. The precast concrete walls and covers have shown both sufficient conductivity and protection against rocks falling from the unlined tunnel roof.

On the cable bridge across the river, the cables are held by swiveling clamps on 9-ft 6-in. centers, between which the cables are supported by aluminum trays. Each cable was deliberately given a sine wave of about 2-in. amplitude with a half wave between clamps. The bridge is open to the weather but the cables are shielded by a checker-plate walkway over the center three cables and by aluminum sheeting over the pair on each side.

The open-air cable terminations were made with the aid of a transportable scaffolding and tarpaulins to keep out the weather. At this end, again, extra lengths of cable were looped as provision for remaking cable terminations in case of failure.

The installed cables were successfully tested one-by-one at 760 kv dc for 15 min. After the tests, the temporary elephantide discs were removed from the cable terminal boxes and connecting links were fitted between the cable terminals and the transformer bushings. The cable boxes were circulated a final time under vacuum with degasified transformer oil.



CABLE TROUGHS are made of precast concrete. Precast slabs over six of the seven troughs serve as a floor. The sketch is only schematic

General Electric turbine design engineers: A. W. Rankin and J. E. Downs

NOW BEING BUILT FOR CLEVELAND ELECTRIC ILLUMINATING COMPANY

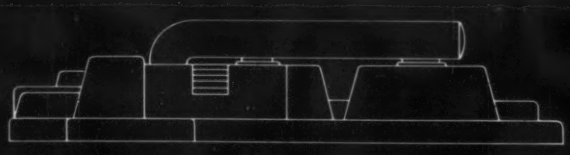
First Pre-Engineered Tandem-Compound, Triple-Flow, Reheat Steam Turbine, With Higher Ratings, Improved Performance

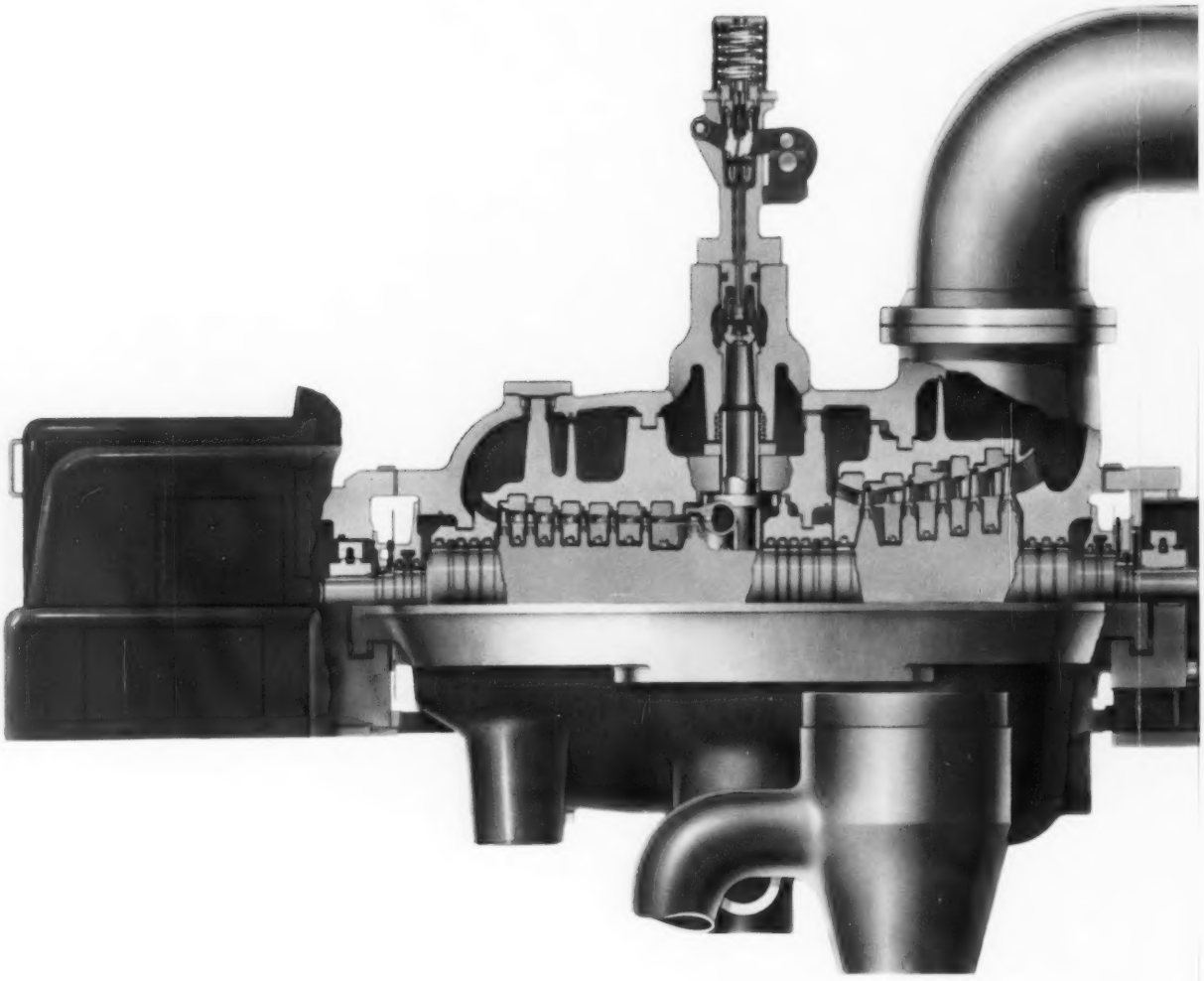
Design progress allowing all high-temperature parts to be combined in one casing is the key to General Electric's improved tandem-compound, triple-flow turbines. Now available in ratings up to 300,000 kw, the first installation of this design will be at the Lake Shore Plant of Cleveland Electric Illuminating Company.

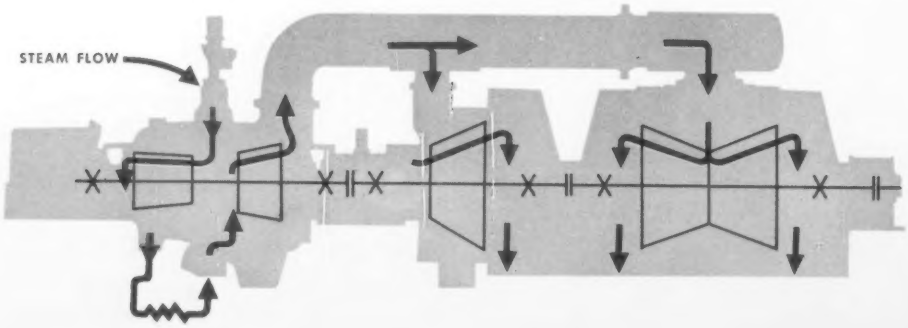
By combining all the high-temperature parts into the first span, the pressure and temperature differential across the single-flow and double-flow spans has been decreased. This allows a stronger rotor assembly through selection of rotor materials with low-temperature properties, including high strength and good ductility.

For improved performance, an extraction may now be added ahead of the last stage in the single-flow section; steam flow reduced with a new double-flow hood; and steam losses cut with new end packing. 244-80

GENERAL ELECTRIC






STEAM FLOW

Here Are Some Of The Features Which Make General Electric Pre-Engineered Steam Turbines Your Source Of Profitable Power

IMPULSE-TYPE CONSTRUCTION

Maintains high efficiency
Lowers maintenance costs

Impulse-type construction reduces pressure drop across the buckets allowing for greater clearances while maintaining high efficiency. Rugged design further minimizes possible damage caused by foreign matter.

CASING DESIGN

Maintains high efficiency
Provides greater availability and reliability

Symmetrical design minimizes casing stresses and distortion with temperature changes. Location of inlet valves on the upper and lower casings inherently minimizes entrained steam, resulting in faster governing.

TRUE CENTER LINE SUPPORT

Maintains high efficiency
Reduces installation and maintenance costs

This construction minimizes distortion and misalignment during operation thereby maintaining proper spill strip and packing clearances. The easy-alignment feature of this construction means much less installation time spent on alignment.

ROTOR CONSTRUCTION

Provides greater availability, easy operation

Greater rotor stability is achieved because of improved heat transfer through integral wheels and with external dovetails which avoids cramping the shaft.

REMOVABLE RADIAL SPILL STRIPS

Reduces installation and maintenance costs
Provides greater availability

The spill strips incorporate separate segmented strips that are inserted in the outer ring of the diaphragm. Because the diaphragm rings contain the nozzles for the following stage, they are designed to maintain proper clearances under all operating conditions. These strips are inserted in the diaphragm and are easily replaced—merely by removing the old spill strip and sliding in the new one.

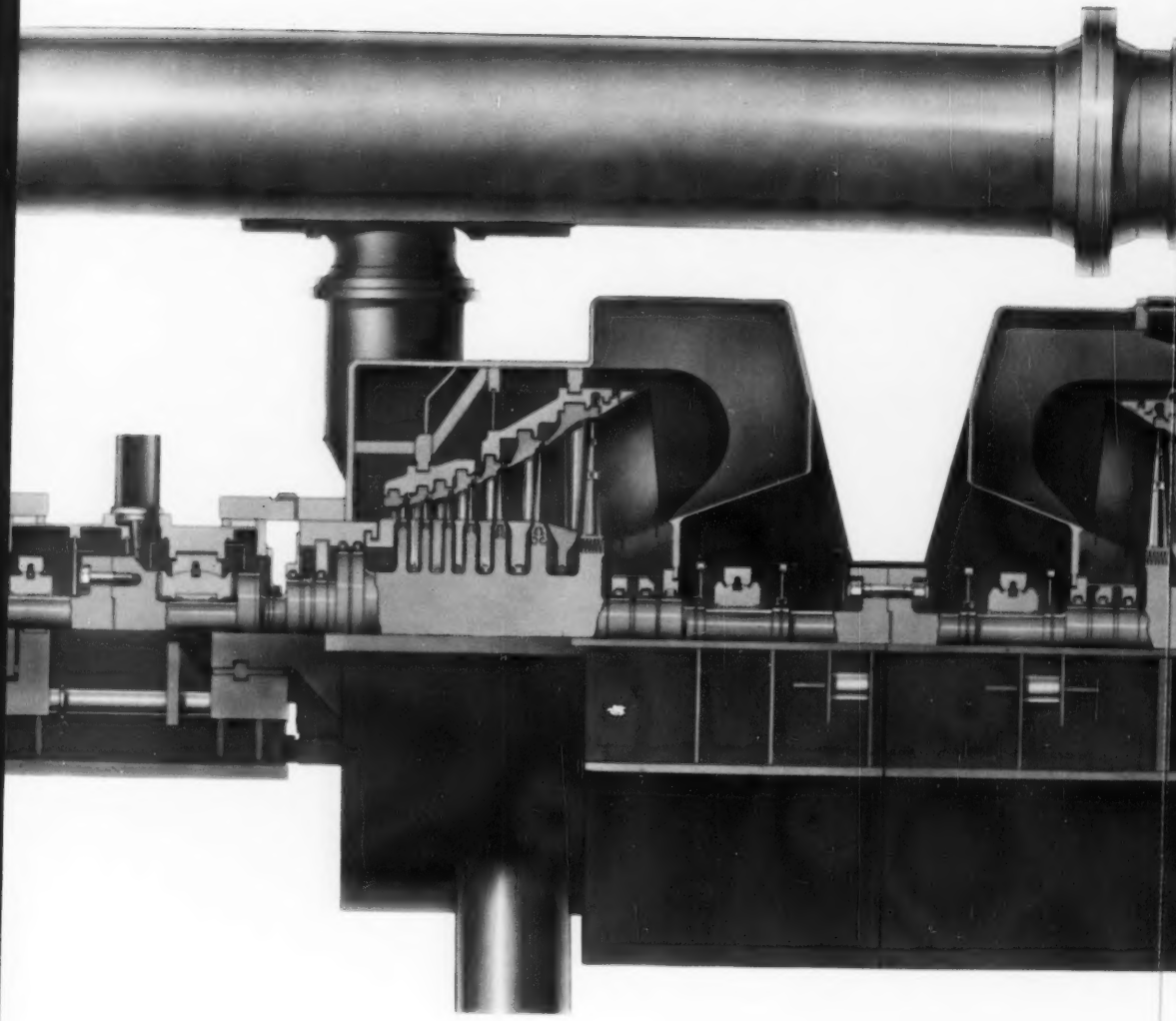
TAPERED LAND THRUST BEARING

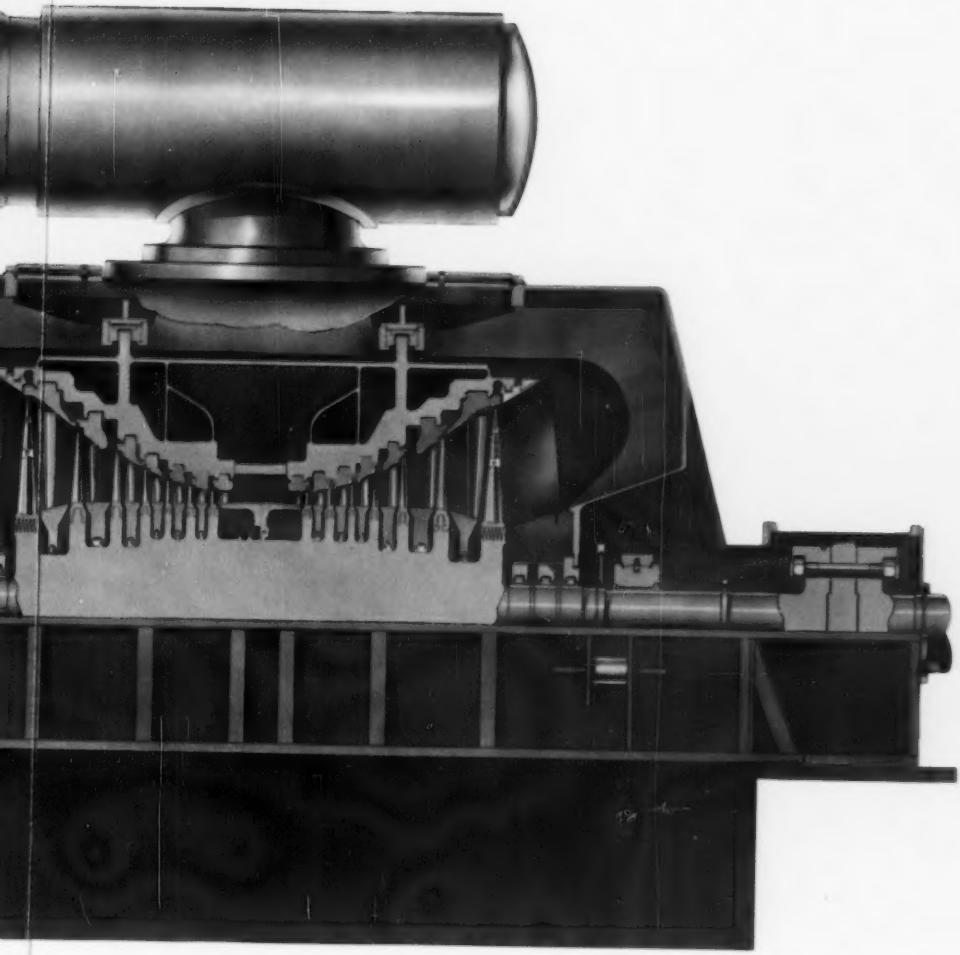
Increases reliability
Provides greater availability

The bearing can carry higher thrust load than any other commercially available turbine thrust bearing. Because of its high unit loading capacity, this bearing is capable of handling maximum possible thrust in either direction.

When planning for your additional generating capacity be sure to consider these and other features which make General Electric steam turbine-generators your best source of profitable power. Contact your nearest General Electric Apparatus Sales Office for more information. General Electric Company, Schenectady, New York.

GENERAL ELECTRIC



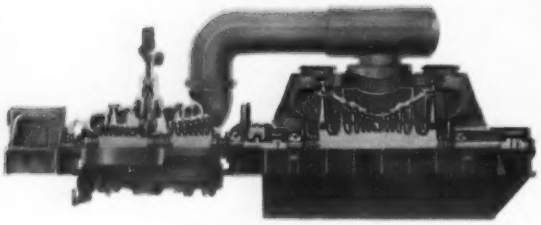


3600-rpm, tandem-compound
triple-flow, reheat steam turbine

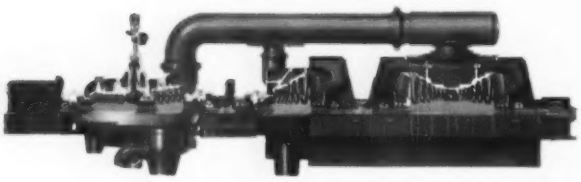
GENERAL ELECTRIC

General Electric Pre-Engineered Steam Turbines

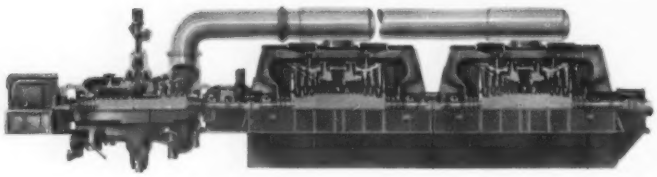
THAT CAN BE ADAPTED TO YOUR SPECIFIC LOAD REQUIREMENTS



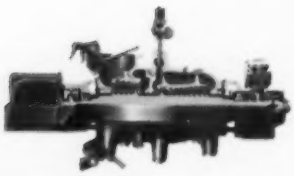
3600-rpm, tandem-compound, double-flow, reheat steam turbine

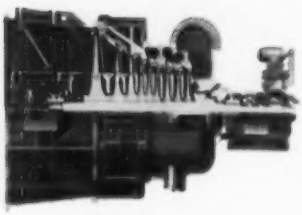


3600-rpm, tandem-compound, triple-flow, reheat steam turbine

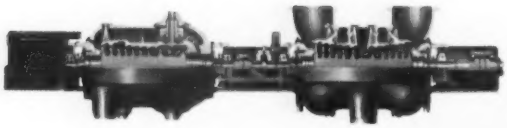


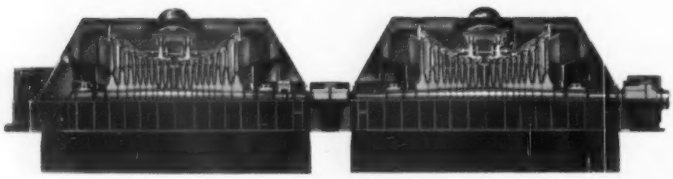
3600-rpm, tandem-compound, four-flow, reheat steam turbine



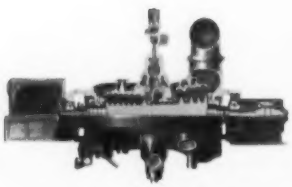


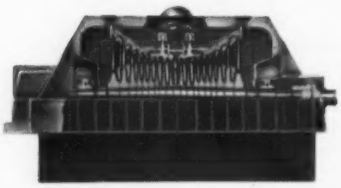
3600/1800-rpm, cross-compound, single-flow, reheat steam turbine





3600/1800-rpm, cross-compound, four-flow, reheat steam turbine





3600/1800-rpm, cross-compound, double-flow, reheat steam turbine

Progress Is Our Most Important Product

GENERAL ELECTRIC

FUEL ▶ **Continued tight supply and firm (or higher) prices for residual fuel oil** are expected in the Northeast in the wake of an Interior Department decision to cut fourth-quarter imports about 5% below those of 1959, down to 415,000 bbl/day. The major oil suppliers had asked for a 29% increase, so the government decision is considered a victory for competing coal suppliers who had urged a little under 400,000 bbl/day. In 1959, actual imports of the fuel in the fourth quarter averaged about 434,000 bbl/day.

"Grave consequences," particularly for east coast electric utilities and other consumers depending on residual oil for burning or heating, were forecast last month by a non-profit oil industry research group if the government did not increase the authorized level of residual imports in the fourth quarter. But the government maintains the arguments for high-stock levels are "over-emphasized" and points out that the oil industry has shown it can import up to 700,000 bbl/day on short notice if a shortage arises.

COMPETITION ▶ **Electrical manufacturers report substantially reduced net income** for the first half of this year compared with the same period last year. Among the companies reporting are: Anaconda Wire & Cable Co, down 70%; I-T-E Circuit Breaker Co, down 67%; H. K. Porter Co, Inc, down 50%; Copperweld Steel Corp, down 36%; Combustion Engineering, Inc, down 29%; Simplex Wire & Cable Co, down 28% (see p 76). And for the second quarter alone, Wagner Electric Corp reports net income is down 31%. A few companies, including Westinghouse Electric Corp and Allis-Chalmers Mfg Co, report increased earnings for the first half, while some, including General Electric Co, report about the same earnings.

Not only American firms are feeling the effects of the extreme price competition now prevalent in many phases of the electrical manufacturing industry. A spot check of overseas firms bidding in the American market reveals that they are losing bids to American suppliers. One overseas firm says that in some cases the American firms have been "completely competitive" in their bids for generators, transformers, and switchgear, while in most other cases they have been "close enough to make it unpleasant." Another foreign firm asks, "How long can the American manufacturers keep this up?"

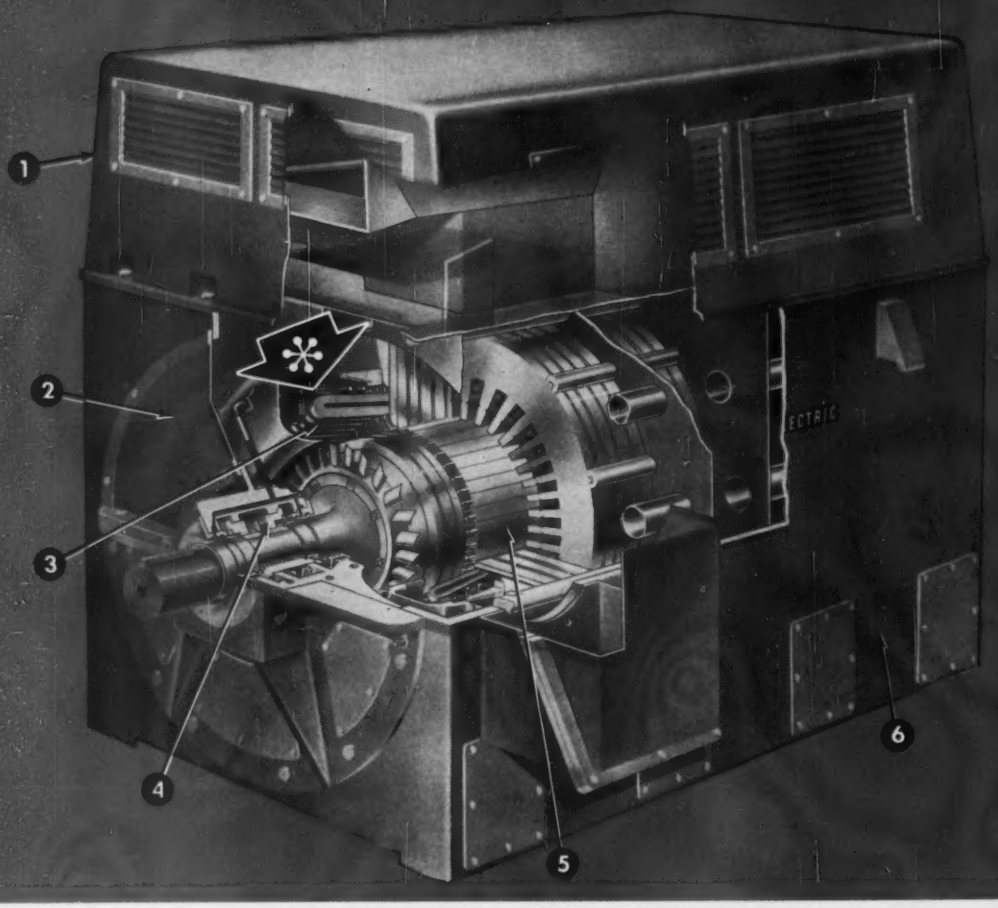
PRICES ▶ **Two more insulator manufacturers announce price increases of 5%.** The Delta-Star Electric Division of H. K. Porter has announced the increase, effective Sept. 1, on distribution porcelain units, including spool, guy, and some items of pin and suspension insulators. Joslyn Mfg & Supply Co's Pinco Division made the increase Aug. 20 on distribution, guy strain and six-inch disc insulators. Joslyn says that "even this small increase is not sufficient to provide for adequate cost recovery and a modest profit."

IDENTICAL BIDS ▶ **Identical bids for lightning arresters are rejected** by Tacoma's Utility Board, as it votes unanimously to bring the bids to the attention of the US Attorney General. The $34,483.50 bids were submitted by Westinghouse Electric Corp, General Electric Co, and Graybar Electric Co, Inc.

PURCHASING ▶ **Tennessee Valley Authority reports on its purchasing for the fiscal year** ending June 30. Total purchases were $484,328,000, of which $328,000,000 went for coal commitments. Other raw materials such as coke, sand, aggregates, etc. added another $4,000,000 while $140,000,000 went for manufactured articles, of which 18% went to manufacturers in its service area and 9% to foreign firms. The remaining $12,000,000 went for miscellaneous services.

NEW General Electric CUSTOM '8000' Boiler Feed Pump Motors . . .

CUSTOM DESIGNED FOR POWER STATION APPLICATIONS



1 **REMOVABLE "TOP-HAT"** provides easy access to motor interior. Top-hat is baffled and lined with sound absorbing materials to attenuate motor operating noise. Rotor and stator are constructed to reduce noise and direct sound waves into the acoustically treated top hat.

2 **NEW END SHIELD DESIGN** reduces time required for inspection and maintenance. One man can quickly unbolt and lift off the upper end shield half and remove the split air deflector. Bearing support is integrally cast with the lower end shield. Lower half of bearing can be "rolled out" for inspection without removing end shield.

3 **EXCLUSIVE POLYSEAL* SUPPORTED SILICONE RUBBER INSULATION SYSTEM** provides superior mechanical, thermal, voltage and environmental endurance—affords top reliability in critical Electric Utility applications.

4 **TRIPLE PROTECTED BEARING SYSTEM** lengthens boiler feed pump motor life. A primary seal is formed by the ring mounted on each end of the bearing shell and adjacent oil slinger machined in the shaft. A multiple groove seal at each end of bearing housing acts as a second line of defense against dirt entrance and oil leakage. In addition to the slingers and close running labyrinth seals, G.E.'s new bearing system utilizes an *Air-Lock* seal in each bearing housing. Air at slightly higher than atmospheric pressure is piped to annular grooves at each end of the bearing. This air pressure acts as a third seal to keep oil locked in the bearing housing.

5 **ROTOR PARTS ARE MACHINED TO PRECISION TOLERANCES** and assembled using especially developed techniques to assure high-speed operational stability.

6 **RUGGED FRAME ASSURES SOLID STRUCTURAL SUPPORT** for stator, end shields, rotor and top-hat. Frame is precision machined to positively align motor parts.

GENERAL ELECTRIC'S "CUSTOMIZED" MOTOR manufacturing philosophy permits the design flexibility, and the adherence to quality control production standards, which assure Electric Utilities of optimum motor performance, reduced operating costs and lower first cost. In keeping with requirements of Electric Utilities, Custom '8000' boiler feed pump motors are available now in ratings to 10,000-hp. 883-01

* Trade-mark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEW

encapsulated connection harness increases mechanical strength, assures maximum motor reliability

General Electric's new encapsulated connection harness consists of two rings of insulated conductors encapsulated in epoxy resins. The larger ring contains motor leads and phase connections, while the smaller ring contains equalizer connections.

This new system provides greater strength and rigidity at the end turns and assures uniform coil connections. Rigid encapsulation prevents contact between conductors—eliminates insulation abrasion. The epoxy compound provides additional insulation for leads and connections.

NEW ENCAPSULATED CONNECTION HARNESS for General Electric boiler feed pump motors provides an immobilized connection bundle . . . eliminates loose ties and abraided insulation.

YOUR GENERAL ELECTRIC APPARATUS SALES REPRESENTATIVE has full details on new G-E boiler feed pump motors. Call him today. Medium AC Motor & Generator Department, Schenectady 5, N.Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Revise Transformer Loading

(*Continued from page 57*)

But if 3/0 all-aluminum conductor had been selected for a 1-kw load, it would be an excess annual secondary investment cost and no advantage over the use of 1/0 all-aluminum in serving the 5-kw-per-home load that could develop.

Secondary capacitors in the initial construction of a secondary system to serve a new subdivision are not desirable, the study showed. In no case does the most economical combination for a particular loading call for more than a few secondary capacitors. In view of the inaccuracy of load prediction, it appears that where a few capacitors are indicated, they may be omitted during initial construction of a secondary system. PG&E plans to continue restricting the use of secondary capacitors to old systems where corrective measures are needed due to load growth, and to new systems only where the actual load substantially exceeds the estimated load for the system design.

No credit was given in the study to systems not using the entire permissible secondary drop. Before proper value can be placed on voltage drop in the secondary, it will be necessary to make a much larger but similar computer study involving primary as well as secondary systems, as voltage drop utilized in the secondary subtracts from that available to the primary system.

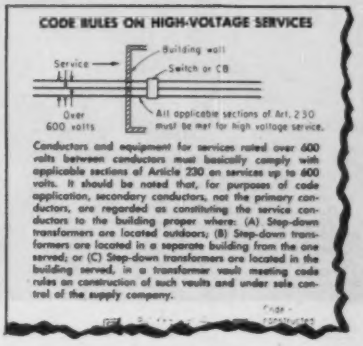
This study aimed at a specific result. While generalizations on secondary systems may be drawn, it was not intended that all aspects be examined. Rather, the study was to verify that loading of distribution transformers on the PG&E system is limited by transformer thermal limitations, not economic or voltage considerations.

A more comprehensive study, using the IBM 705, is under consideration. It would include variables, such as all conductor sizes and materials, span lengths, etc., omitted in this study. The purpose of the new studies would be to provide a company engineering standard for guiding field personnel in selecting the optimum secondary conductor size, transformer size, and transformer spacing, once they had determined the initial load per pole (with all lots utilized) and span lengths.

CONSTRUCTING ELECTRICAL SYSTEMS

By J. F. McPartland and the Editors of Electrical Construction and Maintenance

Here's a modern, comprehensive reference and instruction manual on the methods and techniques used in constructing systems for power, light, signals and communications. Covering the best practice on selecting, mounting, connecting and housing all types of electrical equipment, this manual presents 1959 National Electrical Code data relating to installation. And a wealth of special illustrations are used throughout to clarify fine code points.


CODE RULES ON HIGH-VOLTAGE SERVICES
Service
Building wall
Switch or CB
Over 600 volts
All applicable sections of Art. 230 must be met for high voltage service.
Conductors and equipment for services rated over 600 volts between conductors must basically comply with applicable sections of Article 230 on services up to 600 volts. It should be noted that, for purposes of code application, secondary conductors, not the primary conductors, are regarded as constituting the service conductors to the building proper where: (A) Step-down transformers are located outdoors; (B) Step-down transformers are located in a separate building from the one served; or (C) Step-down transformers are located in the building served, in a transformer vault meeting code rules on construction of such vaults and under sole control of the supply company.

Chapters are broken down on the basis of types of equipment to facilitate ready reference: lighting equipment — motors and controllers — conductors — raceways — switches — overcurrent protective devices — switchboards and panelboards — transformers — capacitors and regulators — power sources — high voltage — signals and communications.

"Constructing Electrical Systems"
Electrical Construction & Maintenance
330 West 42nd St., New York 36, N.Y.
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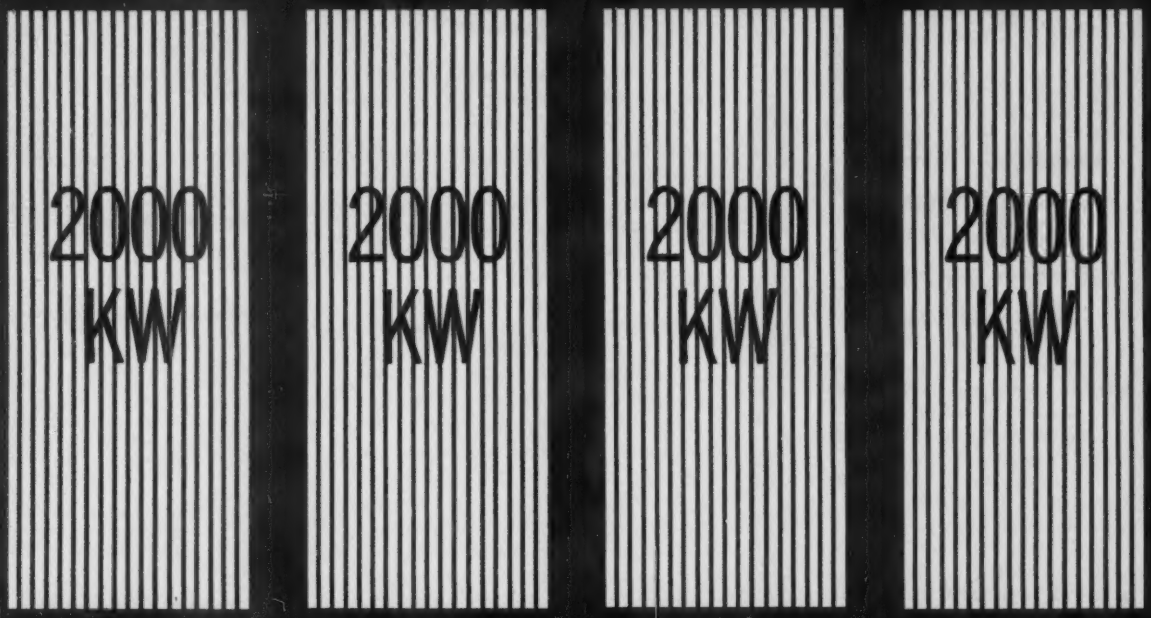


Electro-Motive Peaking Plants

New MU-100 plant $82 per KW, F.O.B. Electro-Motive Factory

For those utilities seeking higher capacity peaking power, the new Electro-Motive 10,000 KW plant offers low investment per KW (as low as $94 per KW installed at site) plus new operating and control features not found on other types of equipment.

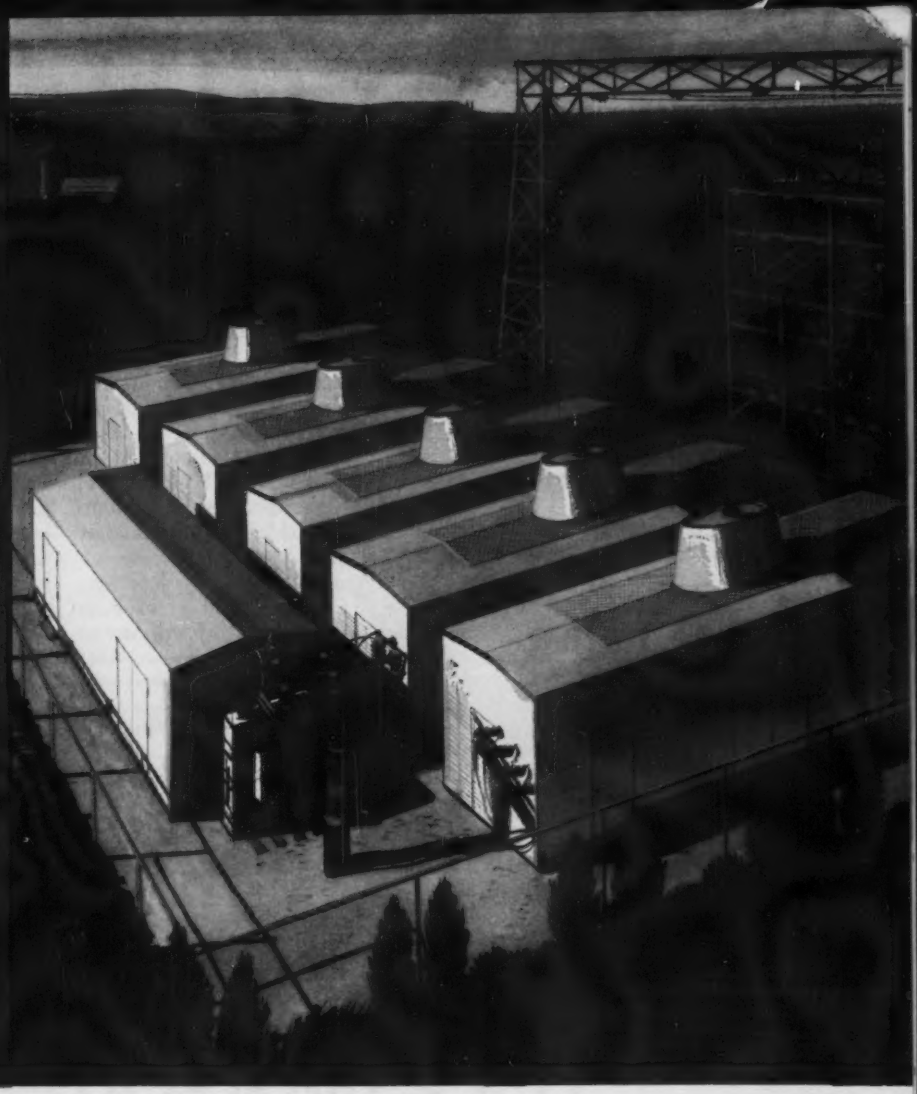
Highly flexible. The MU-100 may be utilized in peaking, reserve or area protection applications. It may be remotely operated by a variety of methods—automatically by voltage or current sensing devices, and by supervisory control such as leased telephone line or by carrier current. Self-contained design permits location at the step-down substation serving the load. Installation is simple and inexpensive, and the plant may be moved at any time to match changing load conditions.

Future expansion flexibility. Smaller Electro-Motive plants (2,000, 4,000, 6,000 and 8,000 KW) can be installed now with control equipment in place to expand later up to 10,000 KW.

By taking advantage of this plan-ahead feature, additional KW capacity can be added later for less than $75/KW *installed*. For example, total end cost for uprating from 2,000 KW to 8,000 KW is the same as the initial cost for an 8,000 KW plant.

New controls. The plant control contains many innovations which further extend flexibility. The plant may be operated remotely at various capacities to match load conditions. Each generator produces 2,000 KW—and each may be operated individually or

NOW
+
2000
KW



now available up to 10,000 KW

in any combination. Thus, the plant will provide 2,000, 4,000, 6,000, 8,000 or 10,000 KW. With selective control a block of power is always available—even during maintenance.

Fast start. From a cold start, the MU-100 is on line carrying load in less than three and one-half minutes. A spinning reserve start has been designed into the plant which reduces starting time to a minute and a half.

With the addition of the MU-100 to the Electro-Motive line, the most complete range of capacities is available in specialized peaking equipment. Thus it is possible to match capacity to need for the most efficient operation and lowest investment. An increase in demand is handled by expanding the plant—at low incremental cost—with additional generating components.

An analysis of utility peaking needs will reveal the savings possible with the application of Electro-Motive equipment. Ask the Electro-Motive representative for information.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS · LA GRANGE, ILLINOIS

Sales-engineering offices: Chicago, New York, St. Louis, San Francisco

In Canada: General Motors Diesel Limited, London, Ontario

MU-20 2000 KW Diesel
MU-14DF 1000 KW Dual-fuel

MU-40 4000 KW Diesel
MU-28DF 2000 KW Dual-fuel

MU-60 6000 KW Diesel
MU-42DF 3000 KW Dual-fuel

MU-80 8000 KW Diesel
MU-56DF 4000 KW Dual-fuel

MU-100 10,000 KW Diesel
MU-70DF 5000 KW Dual-fuel

EEI Half-Year Report Shows Decided Upturn

Capacity increase of 70% in electrical generating equipment ordered by US power systems from domestic sources in the first six months of 1960, compared with the same period in 1959, is shown in Edison Electric Institute's first-half report released this month.

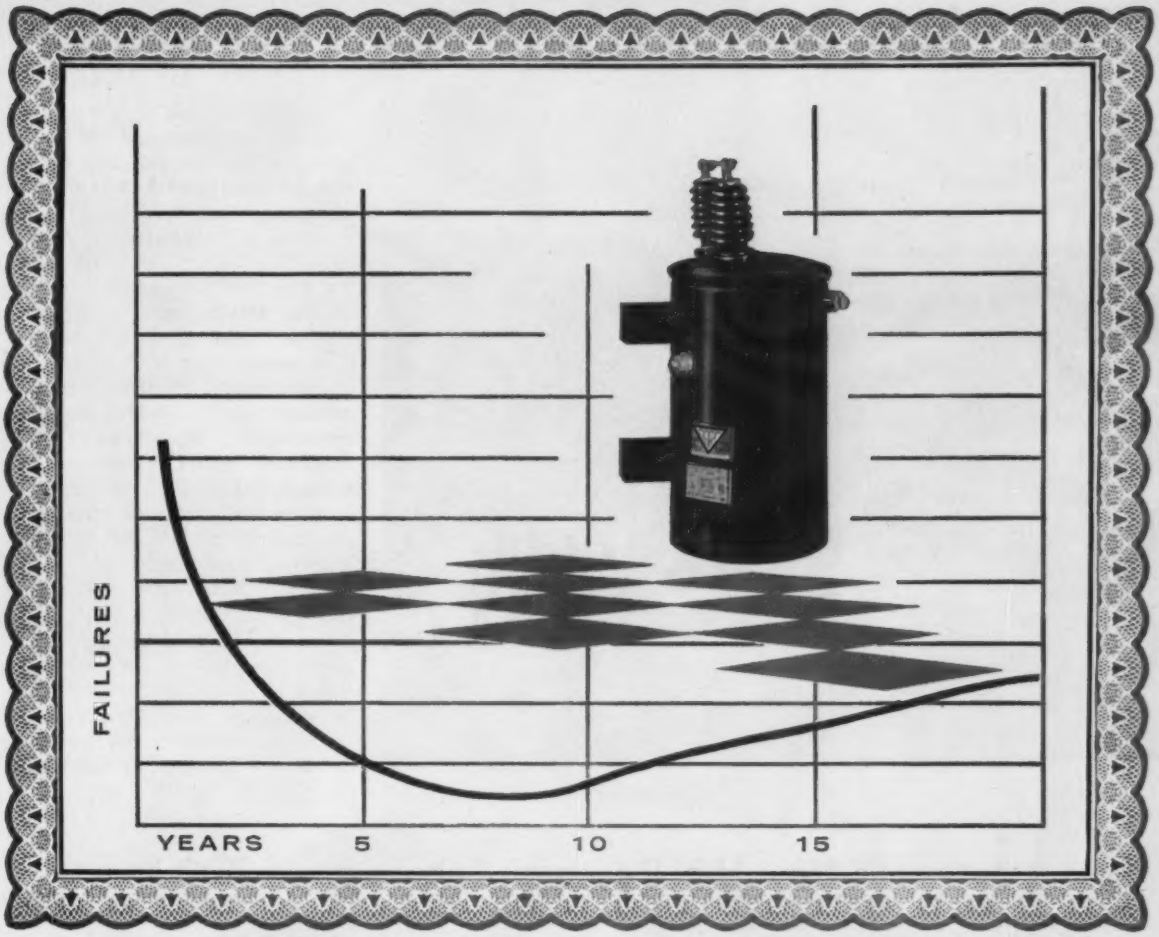
Steam generator orders rose 97%; hydraulic turbines orders, 212%; and power transformer orders, 96%.

Individual number of generating units ordered totaled 63, a 58% increase over the first half, 1959. The smaller percentage gain in number of units ordered, compared with the capacity increase, indicates a continuation of the trend toward the use of larger units. The amount of capacity represented by steam units in sizes below 100 Mw is only 7.3%. Last April, the corresponding figure was 7.6%; a year ago, 8.5%. Eighty percent of capacity ordered was in units of 150 Mw or more. Two thermal generating units of 600-Mw or larger were on order for the first time.

EEI's Electric Power Survey Committee also reported that units ordered totaled 6,856,245 kw of new capacity by the end of June, compared with 4,043,250 kw in the same period, 1959. This brings total of scheduled capacity for first half, 1960, up to 45,330,777 kw, of which 35,910,700 kw are in thermal units (see table below).

	Shipped		Scheduled for Shipment				Ordered
	1959	First 6 months 1960	Last 6 months 1960	1960	1961	1962	1963 and Later	First 6 months 1960
STEAM TURBINE-GENERATORS (10,000 Kw & larger) (Mw)								
U. S. Elec. Power Systems	10,396	4,545	4,264	8,808	8,168	6,628	2,330	4,814
U. S. Industrials	130	65	33	98	171	125	375	144
Exports	1,620	260	141	401	413	142	0	288
Total	**12,146**	**4,870**	**4,437**	**9,307**	**8,752**	**6,895**	**2,705**	**5,246**
GENERATORS FOR HYDRAULIC TURBINES (4,000 Kw & larger) (Mw)								
U. S. Elec. Power Systems	1,619	1,206	1,445	2,650	2,410	1,828	937	2,027
Exports	112	312	208	521	0	0	0	0
Total	**1,730**	**1,518**	**1,653**	**3,171**	**2,410**	**1,828**	**937**	**2,027**
HYDRAULIC TURBINES (5,000 hp & larger) (thousand hp)								
U. S. Elec. Power Systems	3,944	1,401	801	2,202	3,014	830	1,089	2,519
Exports	229	0	108	108	69	0	0	108
Total	**4,173**	**1,401**	**909**	**2,310**	**3,084**	**830**	**1,089**	**2,627**
STEAM GENERATORS (450 psi & higher) (thousand lb/hr)								
U. S. Elec. Power Systems	67,860	24,792	39,201	63,993	60,708	17,908	0	41,936
U. S. Industrials	6,001	3,396	7,851	11,247	3,470	4,000	0	6,547
Exports	11,766	2,271	3,999	6,270	6,480	0	9,290	13,405
Total	**85,627**	**30,459**	**51,051**	**81,510**	**70,658**	**21,908**	**9,290**	**61,888**
POWER TRANSFORMERS (501 kva & larger) (Mva)								
U. S. Elec. Pr. Sys. & U. S. Indl.	41,558	23,523	20,648	44,171	18,368	7,895	1,667	33,913
Exports	1,472	807	1,525	2,332	202	0	0	1,496
Total	**43,030**	**24,330**	**22,173**	**46,503**	**18,570**	**7,895**	**1,667**	**35,409**

(*More News of Manufacturers, on page* 74)



GUARANTEED

for 5 years — further proof of the exceptional quality built into every RT&E Transformer to save you money. The wisdom of this guarantee is borne out by the graph above. This typical mortality curve was developed from actual failure rates of one leading utility and covers all makes of transformers. It shows clearly that most transformer failures due to workmanship and materials occur during the first 5 years of use, the critical period covered by the RT&E guarantee.

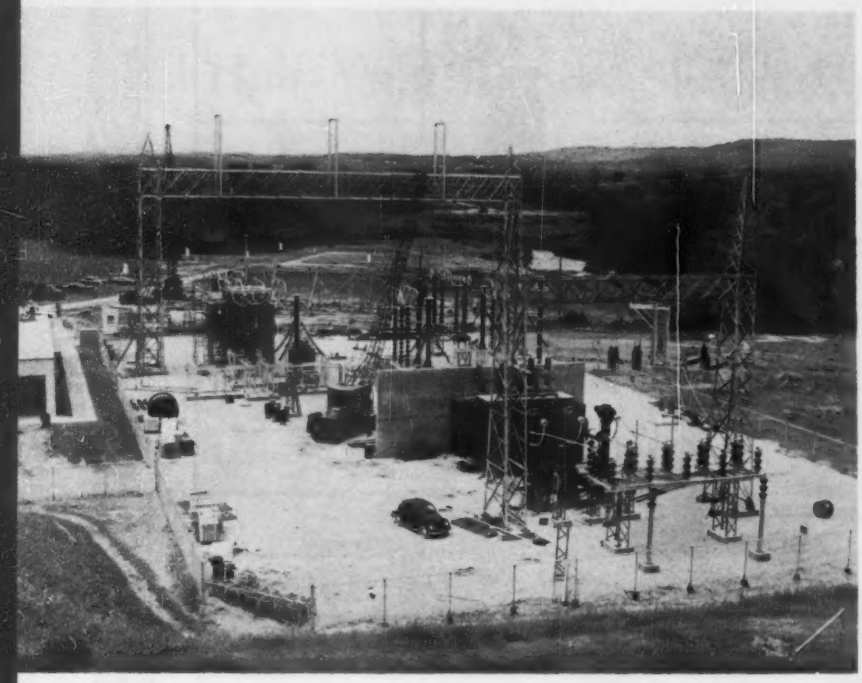
In addition to this 5 year guarantee against defective materials and workmanship, RT&E also guarantees all fully protected transformers unconditionally for one full year.

RT&E CORPORATION

WAUKESHA, WISCONSIN
PORTLAND, OREGON
ARLINGTON, TEXAS

EE

First Phase of Project EHV Nears Completion



General Electric Co's North Station for its Project EHV is approaching completion, with the station structure erected (left) and most of the apparatus installed. The station and a short section of the line are scheduled for operation at 460 kv this fall. Project will operate at the 460-kv level in 1961; in 650 to 750-kv range after that.

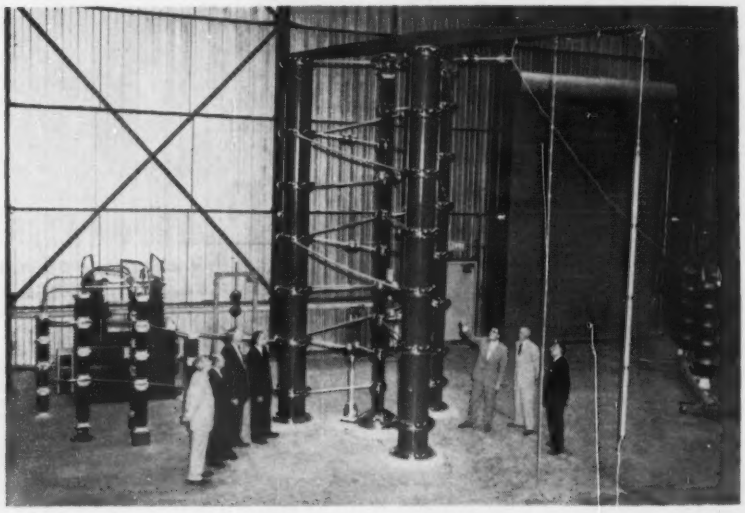
Shown at right in photo are 115-kv disconnect switches, air-blast breakers, and a 40-Mva regulating transformer. A 650-kv (750-kv maximum) power transformer will be installed on the far side of the concrete wall. Headquarters building at left has control and data-gathering equipment.

Truss for the first of the three huge portal towers is being fabricated on the ground (beyond the substation). These steel towers, weighing up to 135 tons each, will permit great flexibility in testing various conductor sizes, configurations, and spacings, forecasts GE.

Line Material's New H-V Research Lab Tests to 700 Kv

Latest step in expansion of Line Material Industries' 134-acre Thomas A. Edison research and engineering center at Franksville, Wis., is the recently constructed high-voltage research laboratory. Tests on a 1.5-Mv surge generator and 700-kv power frequency test equipment were recently conducted before company officials and visiting utility men (below).

Wet and dry 60-cycle flashover tests, puncture tests on bushings and insulators, and radio influence studies can be conducted on the two transformers capable of testing equipment up to 700 kv. Addition of a third transformer will boost capacity of cascaded combination to 1,050 kv.



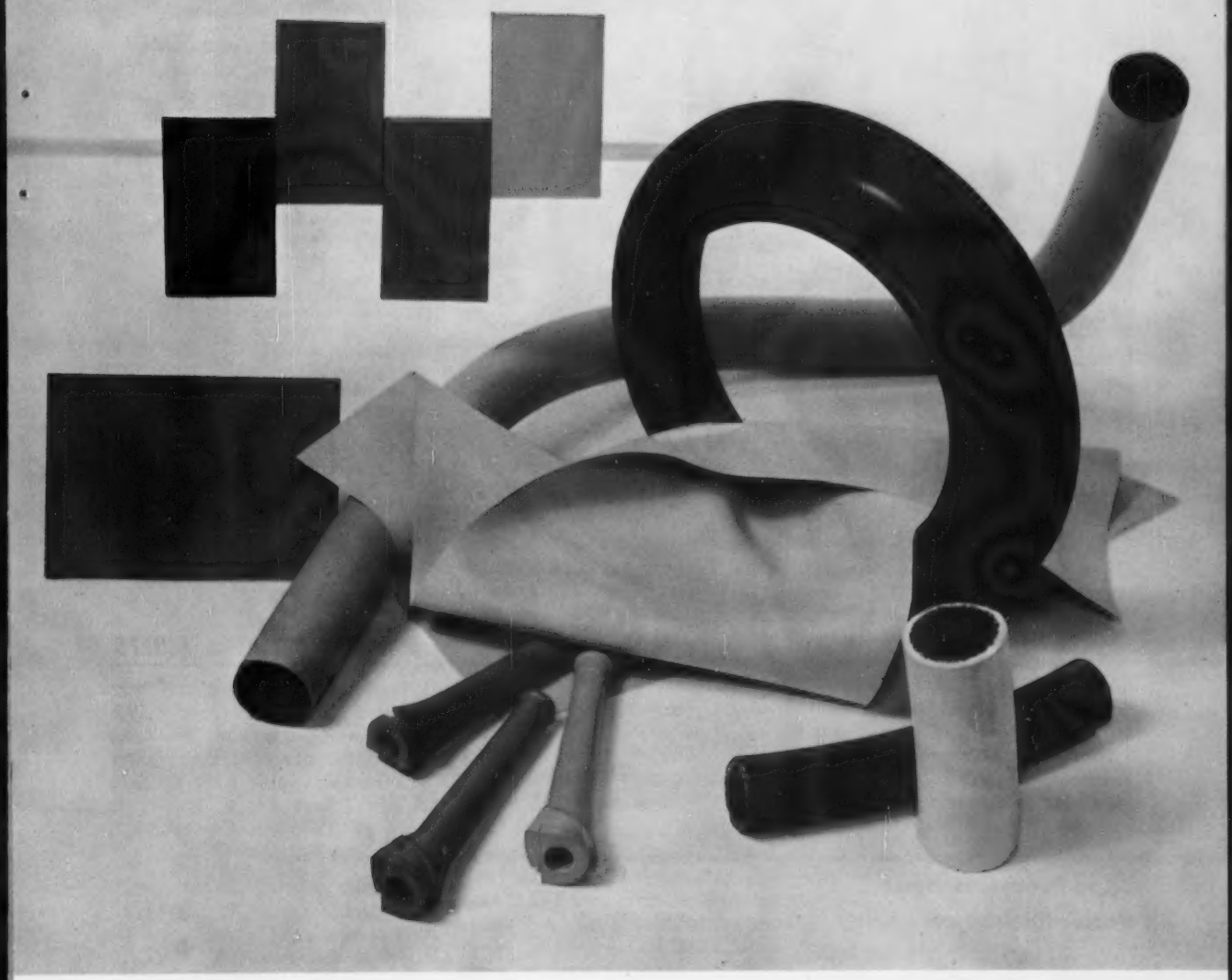
The surge generator and 60-cycle equipment have three times greater capacity than the company's South Milwaukee facilities. (The new laboratory supplements test programs, rather than replacing existing facilities.) The generator is 20 ft high, with nine capacitors, each capable of carrying a 200-kv charge. Designed and built by Line Material, the unit can be enlarged to produce 2,000-kv surges.

The new laboratory is housed in a building which has special sandwich-type construction. Walls, composed of insulation between two layers of metal, provide a shielding effect that frees the laboratory of all outside electrical influence and prevents emission of test sounds.

The company plans to add a low-voltage test bay with an observation balcony.

Naugatuck PARACRIL OZO

THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER



...tough, oil-proof, weather-proof and **colorful, too!**

The samples above should begin to give you some idea of the endless color possibilities in ozone-resistant rubber products made of new PARACRIL® OZO. Now you can give your product color that *sells*... color that identifies for coding wire and cable jacketing... color that blends or *contrasts*... color that works in a hundred ways. And you can give your product other superior properties, too.

Along with color, new weather-resistant PARACRIL OZO gives you a combination of high abrasion resistance, oil resistance, flex life and other valuable rubber properties far surpassing conventional weather-resistant rubbers.

Cast a new eye on the rubber product you make or buy. See the difference color makes. See your Naugatuck Chemical Representative or write the address below for full information on PARACRIL OZO and the advantages it offers.

Naugatuck Chemical

Division of United States Rubber Company Dept. A Elm Street Naugatuck, Connecticut

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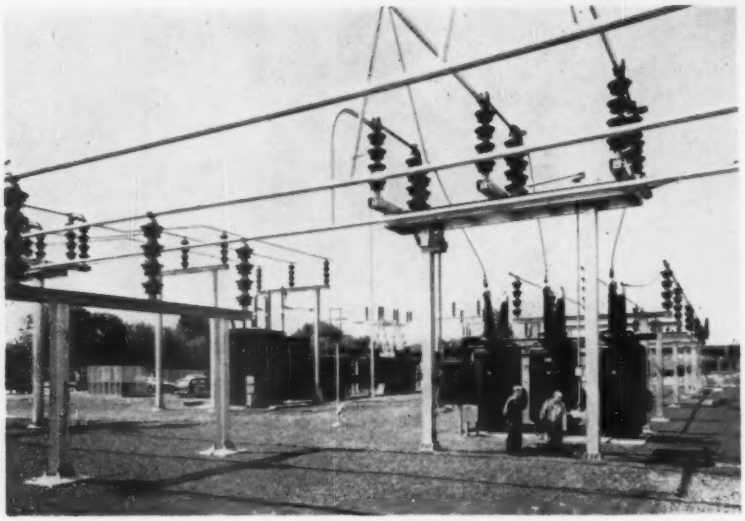


Aluminum Substation Structure on Line

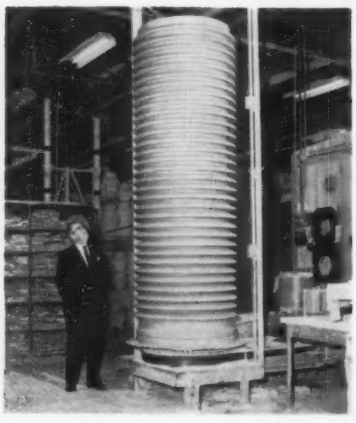
First all-aluminum substation structure to be supplied by Aluminum Co of America's recently formed Structural Division has been placed in operation on the Philadelphia Electric Co system. High and low-level switching buses on aluminum column supports (above) are in use at the 132-13.2-kv Blue Grass Substation in northeast Philadelphia.

The wide-flange, aluminum column sections are of "low-profile" pedestal design. Over 40,000 lb of structural aluminum was needed. This is the first of three aluminum substation structures Alcoa is supplying to the utility.

The substructure employs an all-welded aluminum tubular bus conductor system. It is the thirty-second Philadelphia installation to use aluminum buses.

Lapp Processes Huge Porcelain Insulator

Lapp Insulator Co's Brent Mills, executive vice president, (below) looks up at pinnacle of 345-kv porcelain insulator, believed by the manufacturer to be the largest single-piece porcelain unit of this kind ever made. Bushing is over 112 ft long, more than three ft dia, and weighs about 3,200 lb.



At the pre-firing stage in which the insulator is shown in production at the company's LeRoy, N. Y., plant, it presents a major production problem, says Lapp. It is simply dry clay and quite fragile. Lapp has developed elaborate techniques for handling such delicate pieces.

The "green" clay insulator will be dried, glazed—internally and externally—and fired in a special kiln made for such large units. The porcelain then will be ground flat and parallel to a plus or minus $\frac{1}{32}$-in. tolerance on the overall length, for gasketing against internal pressure. Next, the porcelain will be tested to 308-psi internal hydraulic pressure.

The insulator provides 245 in. of leakage distance.

First-Half Earnings Reported by 18 Firms

Comparisons on net incomes for first half, 1960, and first half, 1959, are provided by the following companies (based on thousand $):

	1960	1959
Aluminum Co of America	21,726	28,936
Anaconda	625	2,101
American Chain & Cable	2,401	2,801
Babcock & Wilcox	9,237	10,186
Baldwin-Lima-Hamilton	1,121	2,674
Burndy	774	482
Combustion Engineering	2,397	3,372
Copperweld Steel	2,254	3,498
Elec Storage Battery	2,630	2,403
I-T-E Circuit Breaker	321	973
Kaiser Steel	6,875	10,198
Minneapolis-Honeywell	11,984	12,286
McGraw-Edison	6,992	6,468
Ohio Brass	921	822
H. K. Porter	2,039	4,058
Simplex Wire & Cable	497	695
Triangle Conduit & Cable	625	1,338
Thomas & Betts	1,442	1,327

MANUFACTURERS BRIEFS

Westinghouse Electric has been awarded a contract to build a 175-Mw turbine-generator unit for Tampa Electric's Gannon Station. The company also received from Toledo Edison Co a contract to build a 135-Mw turbine-generator for its Bay Shore Station.

Wagner Electric recently built two electric motors for high-pressure pumps, especially designed for one of its customers. Each mechanically-modified motor is 350 hp, 1,160 rpm, and designed for 3-phase, 60-cycle, 440-v operation. Motor enclosures incorporate a new compact, standard frame design which is also used for Wagner doubly-protected polyphase squirrel-cage motors.

Anaconda Wire & Cable recently shipped the second of two 10-ton reels of 345-kv electrical cable to Cornell University for the testing program being conducted there. Cornell and a committee of members of Associated Edison Illuminating Co and Edison Electric Institute are coordinating tests involving cable products of four manufacturers. The cable will be placed in underground concrete duct in preparation for tests.

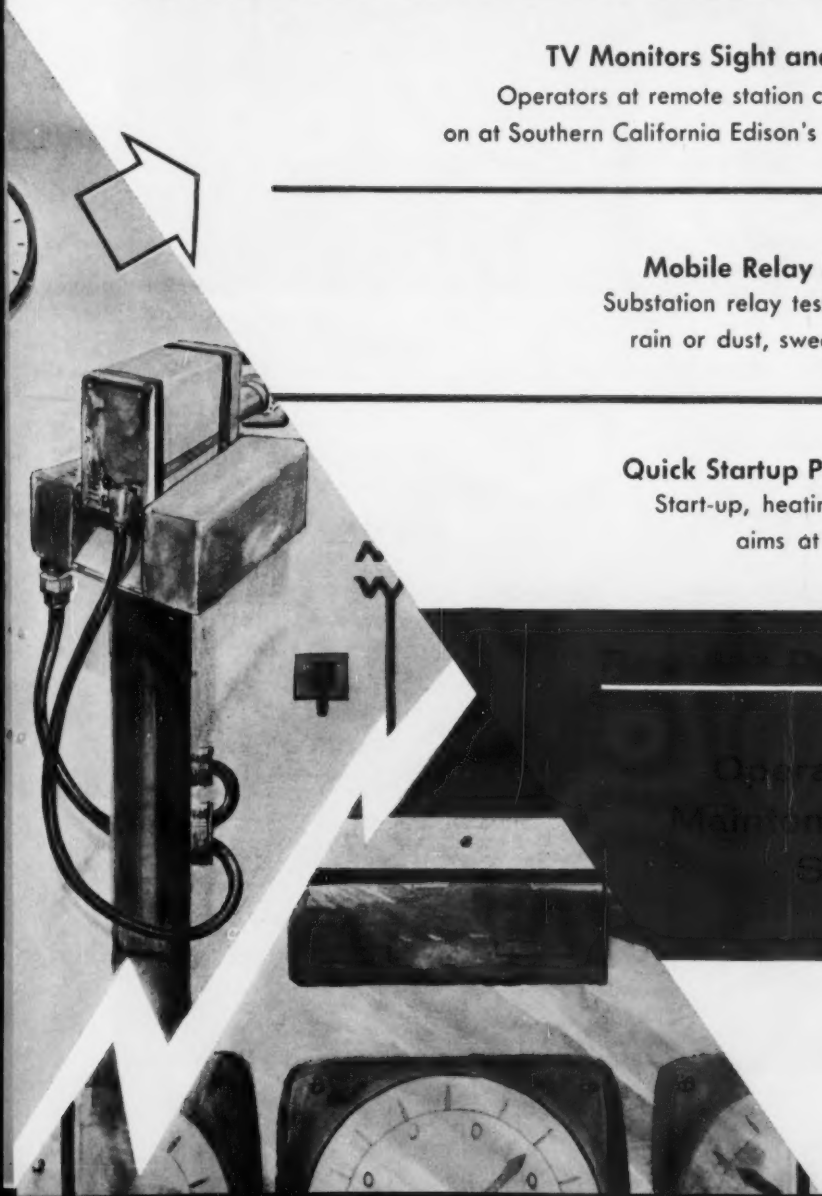
Electrical World Report

JULY
AUGUST

1960

ELECTRIC utility methods

CONSTRUCTION • OPERATION • MAINTENANCE



TV Monitors Sight and Sound at Hydro Plant
Operators at remote station can see and hear what goes on at Southern California Edison's Mammoth Pool Hydro Plant — p 94

Mobile Relay Lab Beats the Weather
Substation relay tests no longer hampered by rain or dust, sweaty hands or numb fingers — p 96

Quick Startup Proved Out for Turbines
Start-up, heating and loading procedure aims at eliminating thermal shock — p 98

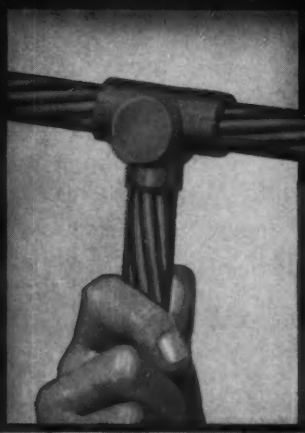
Construction p 100
Operation & Test p 106
Maintenance & Repair p 112
Stores & Shops p 120
Safety p 124

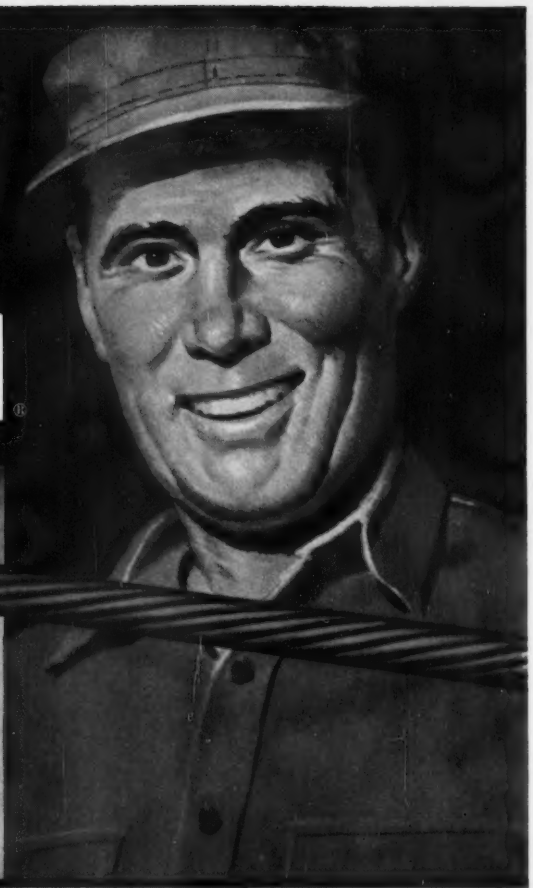
New Equipment p 79
Manufacturers Literature p 128

Now you can weld a perfect, permanent electrical connection every time with

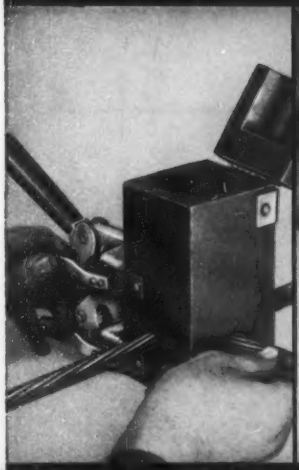
BURNDY thermOweld®

. . . connects easily and economically to any copper conductor or steel structure





Get a permanent THERMOWELD connection quickly... never corrodes or loosens, costs little to install. Current-carrying capacity higher than conductors.

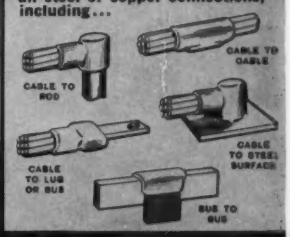


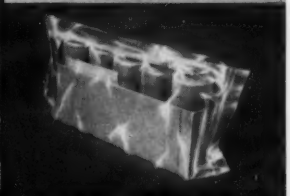
Weld anywhere, to cable or flat, with this compact, lightweight THERMOMOLD. Completely self-contained... needs no external source of power, no special skill.

Pour welding powder into mold, tap to release starting charge. Unique composition of starting charge prevents mixing with welding powder, assures positive firing. Slag easily removed.

Close cover and ignite charge with flint gun. Fast-burning powder fires every time. THERMOWELD reaction forms liquid copper which fuses conductors into a solid copper mass.

You can THERMOWELD almost all steel or copper connections, including...





THERMOWELD fires every time. Cartridges sealed in polyethylene envelopes with moisture absorbing silica gel. Starting, welding charges can't mix...full starting charge assures ignition.

All components are available from your local Burndy distributor. Ask him or your Burndy representative for a demonstration.

BURNDY

59-4

Norwalk, Connect. In Europe: Antwerp, Belgium Toronto, Canada

NEW EQUIPMENT

To obtain more information on these items, use code numbers **indicated for the items when filling in** Reader Service Card

Aerial Lift . . .

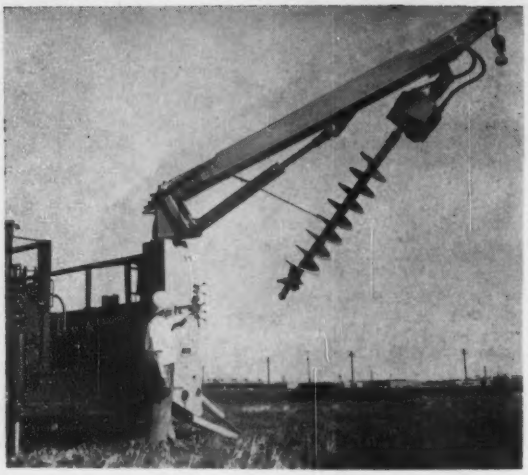
. . . requires no outriggers for stability. Crow's nest, the two booms and the turret arm are of fiberglass. The Servi-Lift has separate motor drives for lifting and for rotation. It can be mounted on vehicles as small as 1-ton trucks. Two models available afford working heights of 36 and 40 ft.
Hunt-Pierce Corp, 59 Meadow St, Milford, Conn. (1)

Vehicular Radio . . .

. . . rated at 100 w is transistorized. The two-way radio comes in a case small enough to be mounted under the dash in most cars and trucks. Frequency band is 25-50 Mc. Standby—ready to receive—drain is 40 milliamp, low enough to permit leaving the radio on with the engine off and not load the battery heavily.
General Electric Co, Lynchburg, Va. (2)

Ultrasonic Cleaner . . .

. . . tunes itself automatically. An integral feedback transducer enables the Autosonic to adjust itself to the proper phase and frequency for each item put in the tank for cleaning. The only control needed is an on-off switch. Its piezoelectric transducer gives it an efficiency of over 90%. Tank sizes of ¾ to 75 gal are available.
Powertron Ultrasonics Corp, Garden City, N. Y. (3)



Turret Derrick . . .

. . . rotates 360 deg and lifts 8,000 lb. It has a working radius of 21½ ft. The model 8-TTD-30-U universal derrick can be mounted at the left or right rear or behind the cab of a utility line truck. A one-man fiberglass basket and an hydraulic digger are available as optional equipment.

Truck Equipment Co, 3963 Walnut St, Denver 5, Colo. (4)

Crawler Trencher . . .

. . . operates where traction is poor. The Ditch Witch trencher, furnished in 9 and 12-hp models, is highly maneuverable, but also digs straight trenches. Its weight, greater than that of rubber-tire models, makes it good for digging in rocky soil. A kit is available for adapting M-3 series trenchers for crawler mounting.

Charles Machine Works, Perry, Okla. (5)

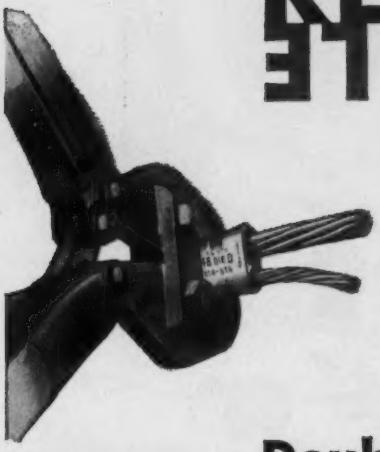
Power Saw . . .

. . . with a gasoline engine needs no oiling and saws while held in any position. Back-and-forth motion of the 16-in. blade is not tiring to operators. Blade of the model GS2016 runs at 10,000 strokes per min. The stroke is $1\frac{7}{16}$ in. and the cut is $\frac{9}{16}$ in. wide. The handle has a three-position throttle, and an instant shutoff stops the saw if it is dropped. The blade moves in a stationary safety guide.

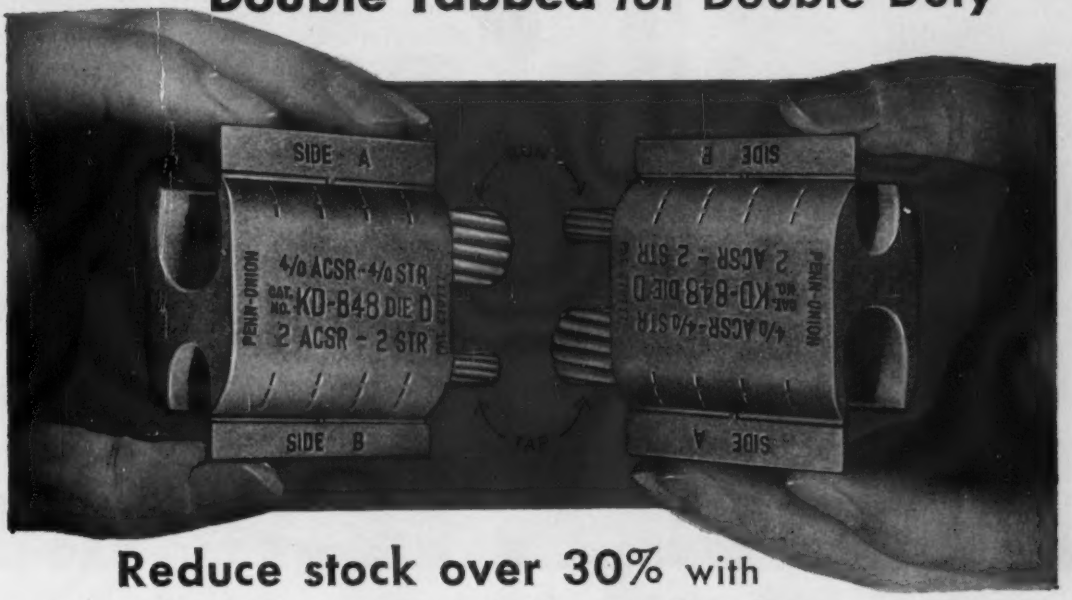
Wright Saw, 207 E Broadway, Louisville 2, Ky. (6)

(*More New Equipment on page* 84)

REVERSIBLE



Double Tabbed for Double Duty



Reduce stock over 30% with

Penn-Union *Double-Tab* "Press-On"

Less Stock— Reversible for dual application.

High Conductivity— E. C. Aluminum extrusions assure cool running high efficiency contacts.

Easy Crimping— Fully annealed for easy installation— deep indent crimp lines.

Pre-Loaded Inhibitor— Cleaned contact surfaces kept free of oxide re-formation by non-dripping Penn-Union "Cual-Aid." In colored polyethylene bag printed with complete information.

Crimp with tools you have

HAND or HYDRAULIC

using O and D dies

Cu to Al— Heavy spacer provides conductor separation and prevents strand cutting. Also minimizes galvanic corrosion.

Weather-Protected— Full-length tab provides complete enclosure for inhibitor.

Cable Protection— Heavy chamfering of cable openings protects main and run.

The Complete Line— Double Tab cable sizes #6 through 4/0. Single Tab cable sizes to 400 MCM.

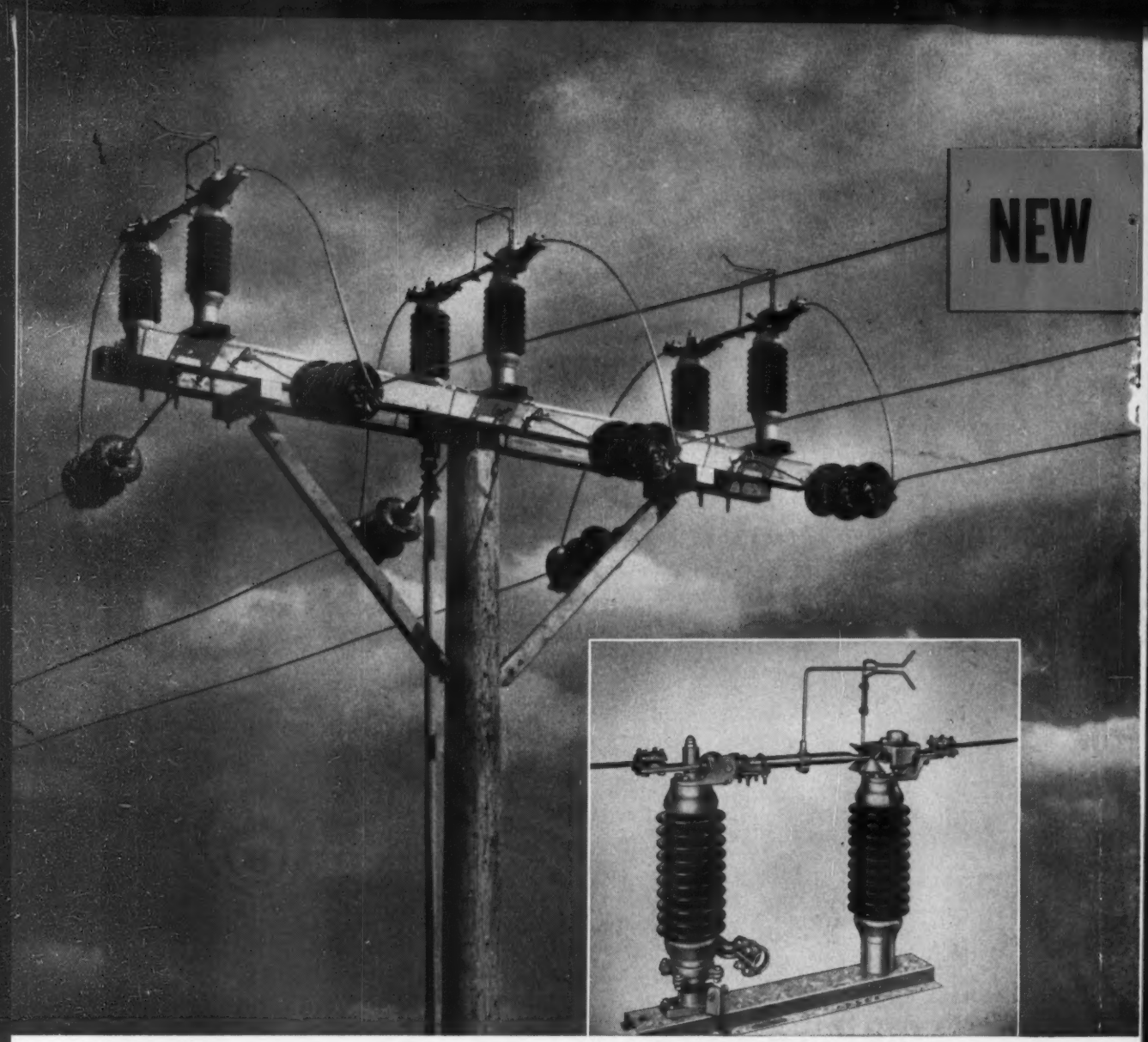
PENN-UNION ELECTRIC CORP., Erie, Pa.

Export Sales—Philips Export Co., 100 East 42nd St. New York 17, N.Y.

PENN-UNION
a good connection

Sold by Leading Electrical Distributors

Catalog Sheets or Samples on Request



NO OTHER SIDE-BREAK DISCONNECT GIVES YOU ALL OF THESE OPERATING ADVANTAGES

- **Correct contact always maintained at blade tip even if crossarm warpage distorts the switch base.**
- **All blades engage fully in the break-contact jaws without precise adjustment of the inter-phase rods.**
- **Less time and labor to install with Kearney original wide-tolerance mechanical design.**
- **Easiest, surest ice-breaking ability available on both opening and closing.**

This newest Kearney development solves long-existing operating problems of crossarm mounted group operated side-break disconnects. The best supporting structure or crossarm construction may . . . due to ice loads, age, wind or line strain . . . deflect enough to distort the switch bases, or alter the relative positions of the three phases. This often causes loss of contact or failure of all blades to close completely in conventional disconnects with both rigid blades and stationary break-contacts.

Kearney's advanced design features a self-aligning blade constructed to permit controlled vertical movement and axial rotation. This automatically compensates for base distortion . . . keeps the blade tip correctly aligned in the contacts. The break-contact swings 30-degrees with the blade as it is opened or closed, producing high leverage ice-breaking ability and full wiping of the silver current transfer surfaces. On closing, the blade tip fully engages the break-contact before the contact moves from its angular open position, compensating for any shift in position of the switch bases. This same feature also allows considerable freedom in interphase rod adjustment, enabling Kearney ***Self-Aligning*** side-break switches to be installed faster and more economically than other types.

The details of these original features for maintenance-and-adjustment-free operation are shown on the facing page.

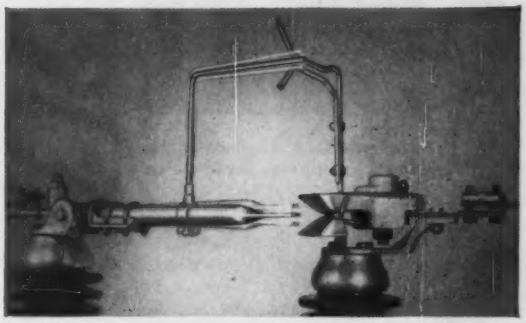
CIRCLE 82 ON READER SERVICE CARD

Kearney's

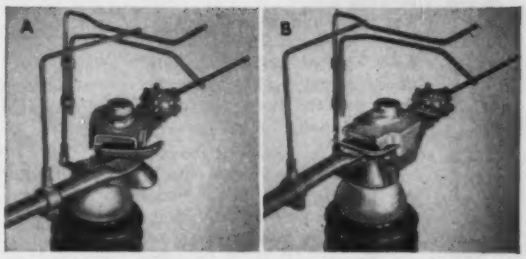
Self-Aligning SIDE-BREAK DISCONNECTS

...always make positive contact, even if the supporting structure warps, twists, bows or settles.

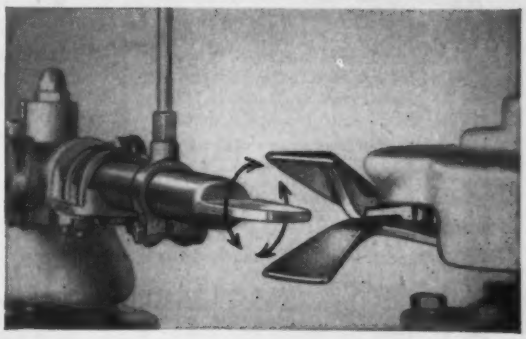
Self-aligning blade moves in a vertical plane to re-establish the original relationship between blade tip and contacts if supporting structure warpage distorts switch base. Wide mouth contact jaws assure blade entry into the contacts. Vertical 1¼" movement more than corrects for extreme cases of misalignment.



Break-contact swings 30° in the plane of blade travel as switch is opened or closed, providing highest leverage ice-breaking and full wiping of the current transfer surfaces. Note that the blade tip is fully engaged, and full contact is maintained (A) through the final 20° of blade travel to the fully closed position shown at (B). This feature allows more latitude in phase rod adjustment than other designs.



Blade rotates 12° on its longitudinal axis. If base distortion has affected blade-contact alignment, the blade tip will rotate as it enters the break-contact to keep all contact surfaces parallel, automatically restoring contact alignment. Friction reducing construction at all rotation points minimizes operating effort.



Switch carries full-rated load current well within NEMA temperature rise, from a fully closed position to 20° partially open position. Ratings available, 7.5 through 69 kv, 600 amperes. Equipped with conventional or whip-type arcing horns... torsional or spade-type operating mechanism. May be mounted horizontally, vertically, or underhung.

For full details talk to your Kearney representative, or write direct for Bulletin 8B.

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

397

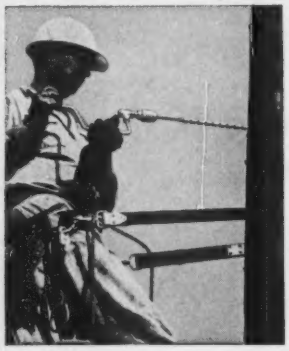
FOR BETTER CONSTRUCTION... SAFER MAINTENANCE

Specify Kearney Products

Plants at: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

New Irwin Pole-Bor Bit

gives non-stop boring



No stopping to clear chips, not even in creosoted poles

Now get easier, faster, non-stop boring action in telephone and power poles with the new Irwin 415T Pole-Bor bit. Chip flow is continuous. Special Irwin cutting head, twist angle, and smooth-polished hollows eliminate clogging and binding — even when boring clean through creosoted poles. Spur on head outlines hole ahead of cutting edge. Side lip then smooths hole, making it easier to insert bolts or pins.

And Irwin's exclusive and patented Adapter Shank chucks perfectly in both hand braces and electric drills to cut inventory costs by 50%, speed work on the job. All Irwin Pole-Bor bits are made of special high analysis steel, heat treated full length and machine sharpened for extra accuracy, longer life. Save time, save money. Order from your Irwin distributor.

Overall Length: Approximately 18", with 12" twist, 6" shank
12 Sizes: 9/16" to 15/16"

Irwin Adapter Shank fits both hand braces and electric drills

Comes like this with taper square shank for use in hand braces.

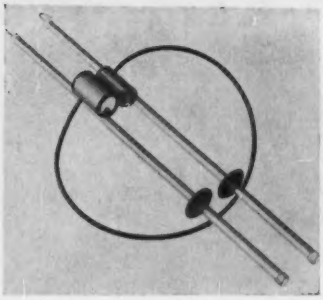
Cut off taper square shank. Use in both hand braces and electric drills. No wobble, no run-out.

IRWIN Wilmington, Ohio
every bit as good as the name

Voltmeter . . .

. . . for live conductors in substations and on transmission lines can be handled by one man. The lightweight device enables phasing and checking voltage drops. The handles, furnished in suitable lengths for voltages to 45 kv, are of fiberglass.

Bodendieck Tool Co, Taylorville, Ill. (7)



Current Transformer

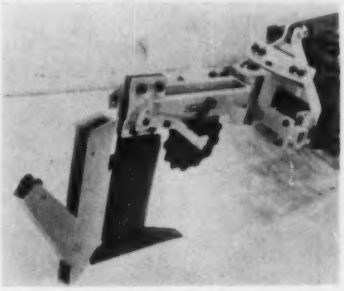
. . . for 600-v circuits is hermetically housed in molded glass-filled nylon. The 1⅝-in. hole accommodates two No. 4/0 RWH conductors. Ratios of outdoor type CH6 CT's are 200:5 and 400:5. Indoor-type CO6 is similar but is not hermetic.

General Magnetics, Inc, 2641 Louisiana Ave S, Minneapolis 26, Minn. (8)

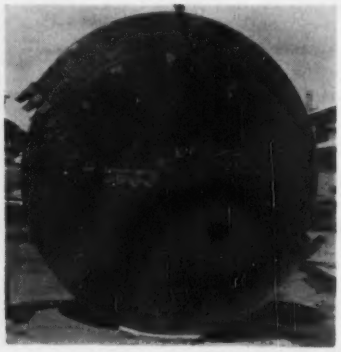
Cable Layer . . .

. . . for all types of cable can be hitched to most crawl or wheel tractors. The rear frame of the model No. 2 cable layer is pivoted for making tight turns. A rolling colter with a steel blade is available for cutting trash.

International Harvester Co, 180 N Michigan Ave, Chicago 1, Ill. (9)



Earth Auger . . .



. . . digs manholes 8 ft in dia. The AA96 heavy duty earth auger shown here is one of the AA series, all of which cut with these replaceable and reversible teeth, which are also for heavy duty. Attachment bars are designed for 5-in. Kelly bars, but special bushings adapt them to shorter bars.

Petersen Engineering Co, Inc, Santa Clara, Calif. (10)

(More New Equipment on page 86)

Still in one piece

Frames from a high speed motion picture showing, successively: venting of gas through the Thorex pressure-relief system at the instant of fault current initiation, clearing of smoke and dust cloud, and the intact housing (far-right) after the test was completed.

Thorex arrester on pressure-relief test survives massive fault current... intact!

Output of several 230-kv transmission lines was added to 75 per cent of the total capacity of one of the country's largest hydro plants to produce the massive fault current used in this test of Thorex arrester internal pressure relief.

Station Class Thorex Type MPR arresters, with internal parts damaged to assure failure, were subjected to a symmetrical rms current of 23,000 amperes which, with offset, gave a 43,500-ampere crest. These arrester housings survived this fault current with all parts completely intact.

Factors contributing to this are (A) Pressure-relief diaphragms, at both ends, larger than the internal diameter of the arrester housing. (B) Direct-acting relief provisions, sensitive to *pressure only*, and functioning in an instantaneous single step. (C) A clear internal path of generous size, not impeded by any circuit parts, passes the rapidly traveling pressure front to the relief diaphragms.

There may come a time when an arrester is expected to fail. When that happens, its ability to remain physically intact can save costly damage to surrounding equipment. Thorex Dynagap Type MPR Station Class arresters have generous safety provisions for such an emergency, demonstrated by severe field testing.

Here is just one more of the many proven reasons why you should specify Thorex Dynagap lightning arresters on your next station construction.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

HOLAN

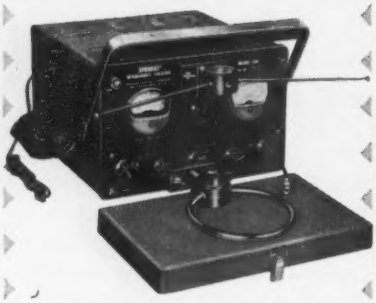
PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10001-H4

SPRAGUE®

MODEL 500 INTERFERENCE LOCATOR

LOCATE rf NOISE SOURCES QUICKLY



This versatile instrument is a highly sensitive interference locator—*with the widest frequency range of any standard available unit!* Model 500 tunes across the entire standard and FM broadcast, shortwave, and VHF-TV spectrums from 550 kc. to 220 mc. in 6 bands.

It's a compact, portable, rugged, versatile instrument—engineered and designed for most efficient operation *in practical field use.* It features a transistorized power supply, meter indications proportional to carrier strength as well as sensitivity of 5 microvolts minimum for 5% meter deflection over entire tuning range.

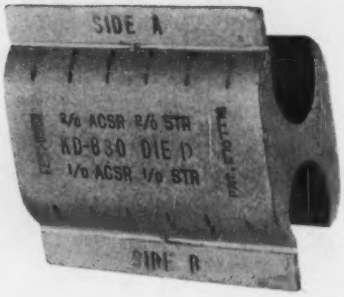
For full details, send for brochure IL-106.

SPRAGUE ELECTRIC COMPANY
315 Marshall Street, North Adams, Mass.

SPRAGUE®
THE MARK OF RELIABILITY

Connectors . . .

. . . for No. 6 to 400 MCM stranded aluminum or copper wire made of high-conductivity aluminum. The spacer-type compression tap connectors are annealed for easy crimping. Grooves, free of oxide, are coated with non-running inhibitor that does not irritate rubber. These connectors also take ACSR.
Penn-Union Electric Corp, Erie, Pa. (11)

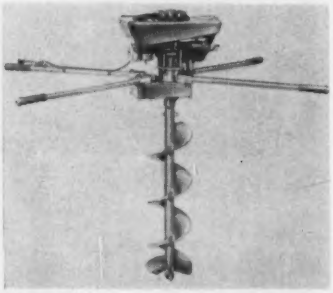


Wheel Loader . . .

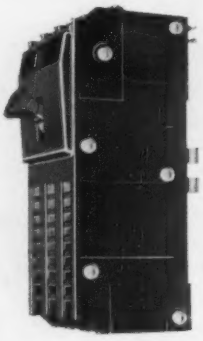
. . . for coal handling and construction is powered by either a diesel or gasoline engine, both rated at 105 hp net. All lift arms and hydraulic cylinders are ahead of the operator's position for safety. The No. 944 Traxcavator has good machine stability. The larger 966 is also available.
Caterpillar Tractor Co, Peoria, Ill. (12)

Power Drill . . .

. . . for two-man operation drills through earth, ice and wood with augers of 2 to 12 in. dia. The model 32's heavy-duty centrifugal clutch, which disengages at idle speeds, also disengages to protect the operators when obstacles are struck.
General Equipment Co, Owatonna, Minn. (13)



Plug-in Breakers . . .



. . . rated at 70 and 100 amp are furnished with 2 or 3 poles. The Q1 circuit breakers' terminals accommodate copper wires in sizes No. 8-1 and aluminum sizes No. 6-1/0. They have temperature compensation to prevent nuisance tripping. They are for load centers and panelboards.
Square D Co, Mercer Rd, Lexington, Ky. (14)

HOW TO SEAL LEAKING TRANSFORMERS

No welding or soldering . . . no special equipment . . . five minute's labor. With Epoxylite® Black Sealer Paste, you can stop transformer leaks in a matter of minutes—no disassembly required, no expensive down-time involved. Simply wire brush the bonding area, stir the catalyst into the Sealer Paste, and apply. Catalyzed paste stays right where it is put, sets hard in a few hours.

The Black Sealer Paste is now being used by more than 150 utilities and over 200 motor repair shops in dozens of time- and money-saving applications, for on-the-spot repair of transformer bushings, cracked terminal boards, chipped commutators . . . used to seal leaking oil-filled cables, waterproof connections, bond brush-holder studs.

One customer saved over $135,000 in two years through use of Epoxylite in a single one of 20 applications. Admittedly, that's exceptional, but many customers frequently save the cost of the entire kit through the use of a single one of the jars.

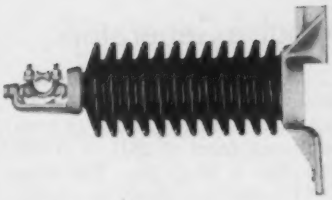
Epoxylite Sealer Kit #1 contains twenty jars of the Black Sealer Paste—each jar enough for one maintenance or repair application. The handy, versatile Kit #1, complete with full instructions, is priced at $28.80, f.o.b. El Monte, California.

Prove to yourself that you can save money in dozens of electrical maintenance and repair applications by ordering a kit today. To place your order, on a satisfaction-guaranteed basis, write or phone:

THE EPOXYLITE CORPORATION

P. O. Box 3397 South El Monte, California
CUmberland 3-8231

or, for a full description of the Kit and a list of 21 proven uses, please write for our free literature.

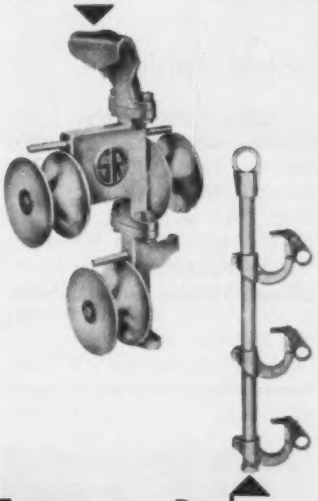


Post Insulator . . .

. . . has a newly-designed clamp that is convenient for hot-line work. The horizontal post insulator requires no crossarms, hence is useful on narrow rights of way. **Ohio Brass Co, Mansfield, Ohio. (15)**

Stringing Block . . .

. . . of aluminum alloy is strong and light. Model MH-303 spacer-type aerial cable stringing block can be adapted in the field for either diamond or inverted wye configuration. A guard at each sheave aids stringing where trees interfere.
Sherman & Reilly, Inc, First and Broad St, Chattanooga 2, Tenn. (16)



Temporary Rack . . .

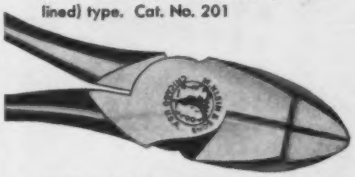
. . . holds secondary wires away from a pole while hot-line work is being done on the primary. It will also hold live conductors out of the way during pole removal or other construction. The rack is suspended by a rope.
A B. Chance, Centralia, Mo. (17)

(More New Equipment on page 88)

KLEINS

for LINEMEN and ELECTRICIANS

The Original Klein Side Cutting Plier—Also available in NE (Streamlined) type. Cat. No. 201



High Leverage Plier—Extra high leverage permits cutting extremely tough wire. Also available in the standard type as shown above. Cat. No. 213-9NE

High Leverage Oblique Cutting Plier—A recently introduced plier designed to cut toughest wire. Cat. No. 228-8

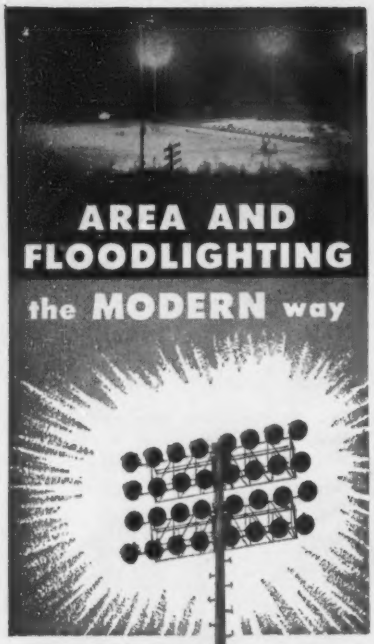
Electrician Conduit Plier—Reams inside and outside of conduit, tightens lock nuts in outlet boxes. Cat. No. 333-8

"Since 1857" the name Klein has stood for the finest in tools and equipment for linemen and electricians. It is the uncompromising high quality back of the name Klein that has won Klein Pliers their place in the hands of men who know good tools. Klein Pliers are now available in a wider variety of styles and sizes than ever before. Be sure the pliers you need carry the Klein trade-mark.

Klein Catalog Free—This new Klein catalog giving complete information on Klein tools and equipment for linemen and electricians will be sent on request. Write for your copy.

Ask Your Supplier—Foreign Distributor: International Standard Electric Corp., N.Y.

Mathias Klein & Sons
Established 1857
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS



TULITO

TAPERED STEEL LIGHTING TUBES

For
- Baseball Diamonds
- Football Fields
- Playgrounds
- Shopping Centers
- Truck Terminals
- Railroad Yards
- Race Tracks
- Radio and TV Towers
- Transmission Power Lines

Engineered for Permanence, Strength and Safety...
Designed to accommodate from 2 to 40 lights.
Streamlined to enhance the appearance of any lighted area.

MEYER MACHINE, INC.
RED WING, MINNESOTA

Impulse Generators...

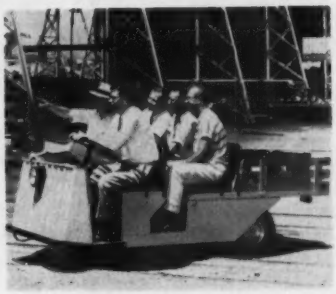
. . . for use with demand meters, totalizing relays, and data counting and printing operates in temperatures from —25F to 150F and has a long life. The type D-41 supplies as many as 10,000 impulses per hr and 10 impulses per disk revolution to demand meters. It is for such applications as billing and tie-line metering.
General Electric Co, Schenectady 5, N. Y. (18)

Oil-Fuse Cutout . . .

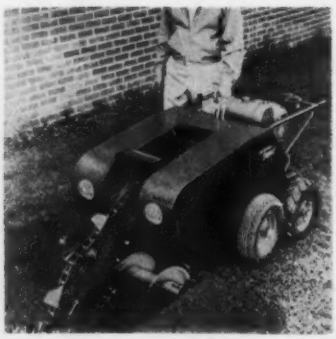
. . . with 110 kv BIL for 15-kv service interrupts 7,000 amp asymmetrical single-phase or 100,000 amp symmetrical 3-phase. Type FC72 cutout carries a load current of 200 amp and will open magnetizing and load currents of 100 amp at power factors of 20% or less.
G&W Specialty Co, 3500 W 127th St, Blue Island, Ill. (19)

Electric Vehicle . . .

. . . carries 1,000 lb plus driver and one passenger. The flatbed measures 46x41 in. The 734 Truckster, which is driven by a 2.5-hp, 36-v dc motor, goes 15 mph forward. It can travel 50 miles on a charge.
Cushman Motors, Lincoln, Nebr. (20)



Trencher . . .



. . . has transport wheels that permit it to be towed to the job site. The Compact trencher, which digs 3 to 6-in. wide trenches down to 5 ft deep, is self-propelled with four-wheel hydraulic drive both forward or in reverse. The 9-hp unit will dig at speeds up to 500 ft per hr.
Auburn Machine Works, Auburn, Nebr. (21)

HOW TO REDUCE COSTS WITH

TABET CONVERSION ADAPTER

EXISTING METER SOCKET

PLUS

ADAPTER

PLUS

PHOTO-ELECTRIC CONTROL WITH EEI-NEMA MOUNT

EQUALS

COMPLETE STANDARDIZATION

No rewiring is necessary to make one photoelectric control do the work of two.

Available either with or without auxiliary load relay, this adapter permits standardization on any Tabet photoelectric control with the EEI-NEMA twist lock connector. Result . . . . fewer items to stock and maintain in the warehouse and on your service trucks.

BRAINY says

"YOU CAN'T BEAT TABET"

TABET MANUFACTURING CO., INC.
1336 Ballentine Blvd. Norfolk 12, Va.

Tabet Photoelectric controls and accessories are distributed by:

LINE MATERIAL INDUSTRIES
South Milwaukee, Wisconsin

Guy Guard . . .

. . . **of white plastic** for good visibility slips easily over new or old guys. The vinyl plastic is corrosion-resistant and lightweight. Se Gards are available in two sizes for stranded cables ¼ to ⅝-in. dia.

Plastic Engineering & Sales Corp, Box 1037, Fort Worth, Tex. (22)

Connector . . .

. . . **for aluminum and ACSR** conductors is furnished for wire sizes from No. 4 to 477 MCM stranded. Jiffy Joint connectors are tapered inside to make it easy to insert the conductors. ACSR conductors with single steel strands are spliced as rapidly as all-aluminum wire.

Rome Cable Div, Aluminum Co of America, Pittsburgh 19, Pa. (23)

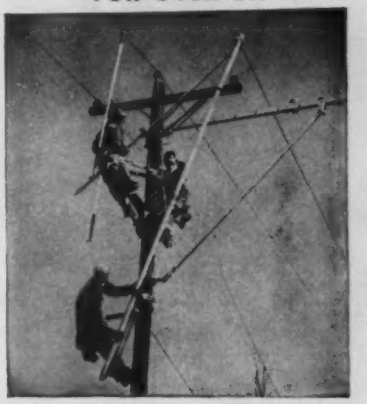
Safety Block . . .

. . . **prevents wearer from falling.** A sudden pull on the Sala safety block engages a locking device and the rope is stopped in about

(*Continued on page* 92)

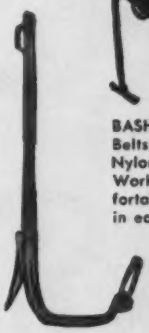
Bashlin's Quality

FOR OVER 30 YEARS

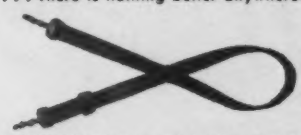


TOOLS OF SAFETY . . .

BASHLIN Quality Body Belts with the additional Nylon Safety Feature . . . Work Safely . . . Comfortably . . . with tools in easy reach.



BASHLIN Quality Alcoa Aluminum Alloy Adjustable Climbers with replaceable gaffs . . . There is nothing better anywhere!



BASHLIN'S Nylon and leather Safety Straps . . . Bashlin Quality, of course.

You Can't Afford Anything LESS Than the BEST—

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Highest Quality For Over 30 Years

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EXPORT: Copperweld Steel International Co.

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Ask for . . . CATALOG NO. 55

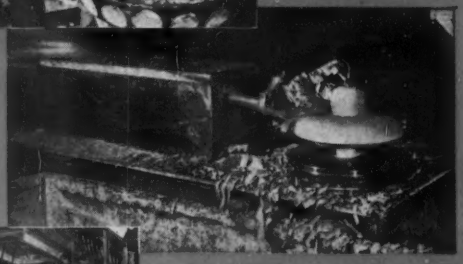
W. M. BASHLIN CO.
GROVE CITY, PA.

Modulus of rupture measurement, a routine laboratory check on strength of porcelain bodies, body-and-glaze combinations and sanded cementing surfaces.

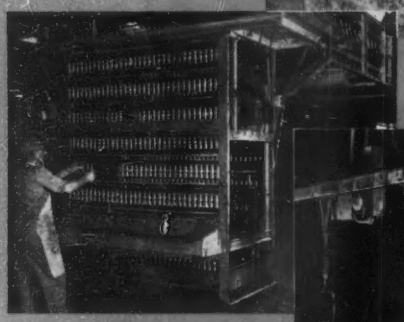
At Lapp, suspension

Uniformity of Lapp suspension discs begins with the billets of clay, automatically extruded and sliced to exact size.

Automation all the way! Plunging of lower surfaces of suspension discs is by this automatic machine.

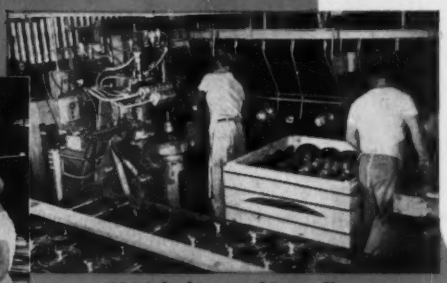


Plunged blanks, their moisture content controlled by an exact temperature-humidity-time cycle, are automatically trimmed to precise size and shape.

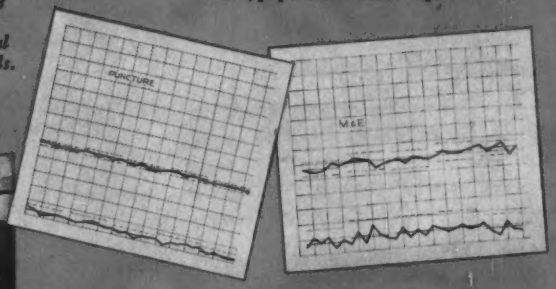


Uniform thickness of resilient paint on pins within insulator head is assured by this automatic pin-dipping machine.

Glazing is mechanized, too, by this machine which glazes insulator shells and applies uniform internal and external sand cementing bands.

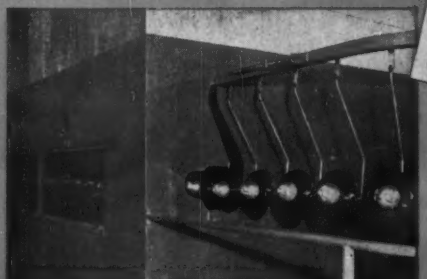


Mutiple-duty machine pulls each insulator at Proof Test Load and trims off surplus cement, paper used under cap.

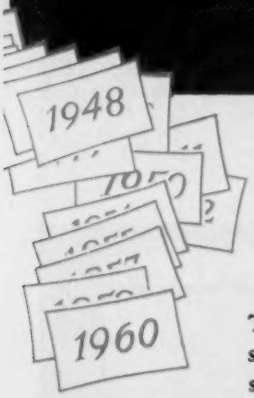


A fixed percentage of production is allocated to quality control testing. Charts like these, of M&E and puncture values, show the continuing improvements in characteristics and uniformity resulting from Lapp production mechanization.

Every Lapp suspension unit is tested mechanically and electrically. This conveyer carries finished insulators through 60-cycle flashover test for a minimum period of three minutes.



insulator design and production are matters of continuous improvement



we make 'em good...
...and keep making 'em better

Take a look at your last shipment of Lapp suspension insulators. Compare them with some of Lapp's 40-year-old veterans you'll find serving on lines all over the country. You probably won't notice much difference. Yet they're nearly as different as is today's Thunderbird from 1920's Model T.

That's because product improvement is a continuous program with Lapp. We re-design, we test, we prove—and year-by-year we build valid improvements into our insulators and our production processes.

The results? Significant strengthening of every measurable characteristic. Elimination of even the maverick under-strength (and over-strength) individual units. Mechanization of every phase of production, for predictable uniform response to all test standards.

That's the way it is at Lapp. We make 'em good... but we keep making 'em better. And this extra we put into our suspension insulators merits your confidence when you install them, and means extra service after they're up.

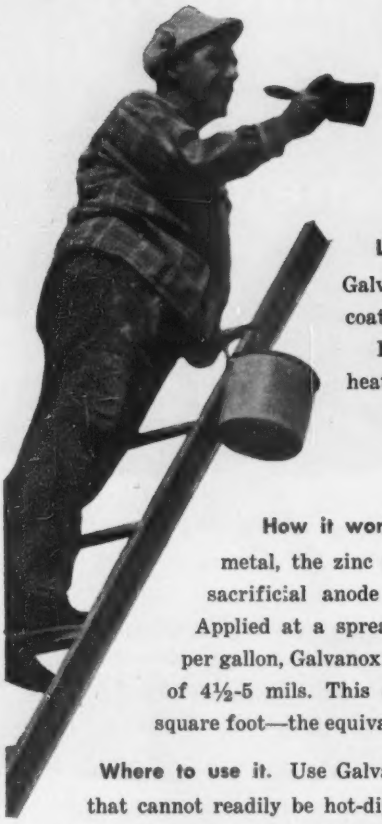
Lapp Insulator Co., Inc.,
Le Roy, N. Y.

Lapp

CIRCLE 91 ON READER SERVICE CARD

Next to Hot-Dip Galvanizing

GALVANOX



DOES IT BEST

Like a paint, but not a paint. Galvanox is a ready-mixed organic coating saturated with metallic zinc It requires no curing agent or heat treatment. Brushed or sprayed on, it provides electro-chemical protection not possible with ordinary paints.

How it works. In direct contact with base metal, the zinc particles in Galvanox act as a sacrificial anode to establish a galvanic cell. Applied at a spread rate of 150-200 square feet per gallon, Galvanox establishes a dry film thickness of 4½-5 mils. This deposits 2 ounces of zinc per square foot—the equivalent of new hot-dip galvanizing.

Where to use it. Use Galvanox to coat any iron members that cannot readily be hot-dip galvanized. Use it to restore galvanized areas damaged during fabrication or construction. Use it to cover welds, drill holes and untreated rivet and bolt heads. Use it to renovate galvanized hardware and guys, pipes, structures and equipment.

Send for a copy of "Galvanox by Subox."

SUBOX PAINTS

Subox Inc.

Trade Mark

Established 1924
3 Fairmount Plant, Hackensack, N. J.
Subox Company of Canada, Weston, Ontario

Safety Block

(*Continued from page* 89)

1 ft. But when the wearer moves normally, the spring-loaded rope drum pays out and winds in automatically. It holds 16 ft of steel wire rope.
Machinery Center Inc, 1201 South 6th West, Salt Lake City 10, Utah. (24)

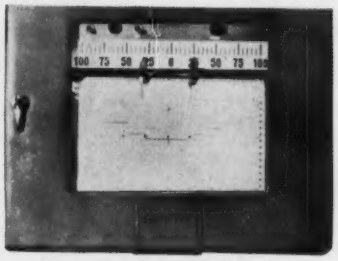
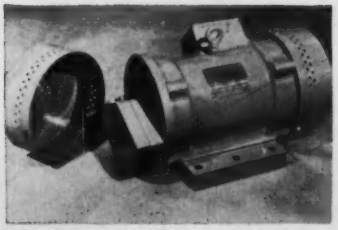


Chart Recorders . . .

. . . of null balance type mark records on a strip chart 12 in. wide and 122 ft long. Type MR1SL with one pen and MR2SL with two pens handle a variety of inputs. Chart speeds are 15, 30, or 60 in. per min. Drive power is taken from 115-v single-phase source.
Schaevitz Engineering, Box 505, Camden, N. J. (25)

Motor Vibrator . . .

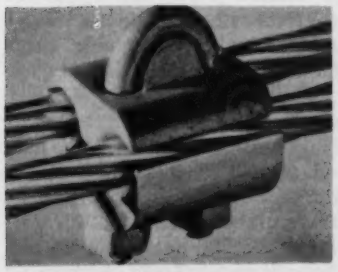
. . . for cleaning coal or vibrating hoppers has out-of-balance weights at each end to generate vibration. The motor has heavy-duty bearings and a robust shaft. The totally enclosed, dustproof weatherproof units are furnished



in ratings from ⅛ hp to 1½ hp. **English Electric Export Trading Co, Ltd, 750 Third Ave, New York 17, N. Y. (26)**

Vinyl Tape . . .

. . . never freezes. At —20F, it still sticks and remains flexible. Slipknot CW can be used up to 120F.
Plymouth Rubber Co, Inc, Canton, Mass. (27)



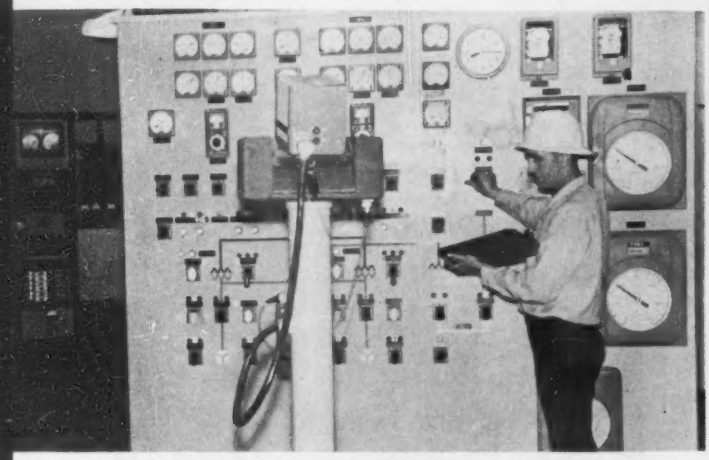
Deadend Clip . . .

. . . for aluminum and ACSR wire has its U-bolt oriented 90 deg from the usual position to make installation easy. The No. 2412 clip can be installed on a deadend without being disassembled. **Aluminum Co of America, 1501 Alcoa Bldg, Pittsburgh 19 (28)**

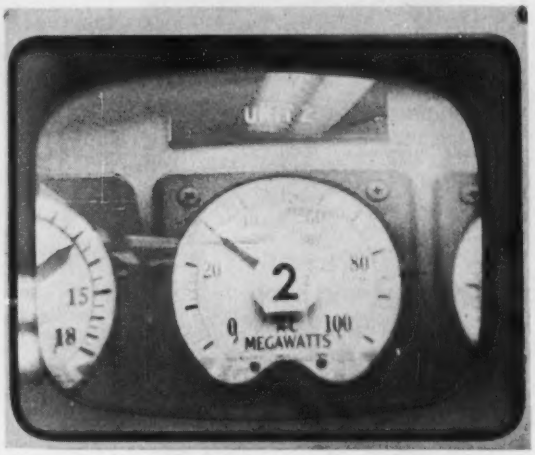
LUMATROL® MARK I !

If highest reliability at lowest cost is your most important requirement in automatic street light control... *this is the baby that will do the job!*

Write for Complete Specifications
MICRO BALANCING, INC., Garden City Park, New York
In Canada: J. R. Kearney Corp., Box 270, Guelph, Ontario



TV CAMERA, pedestal-mounted in front of panel, is checked out prior to placing the "control room" on unattended status



ZOOM CLOSEUP can be quickly changed to a full view of the unattended station's control panel

TV Monitors Sight and Sound at

H. F. SALIGER JR, Electrical Design Supervisor, Southern California Edison Co, Los Angeles, Cal.

Operators at a remote control station can see and hear what goes on at Southern California Edison's new Mammoth Pool hydro plant. Visual contact is made through closed circuit TV linked by microwave. Sound monitoring of turbine and machine room areas carries "hearing" to the remote station to provide operators with a continuous "feel-of-the-situation" plus a quick warning of abnormal conditions.

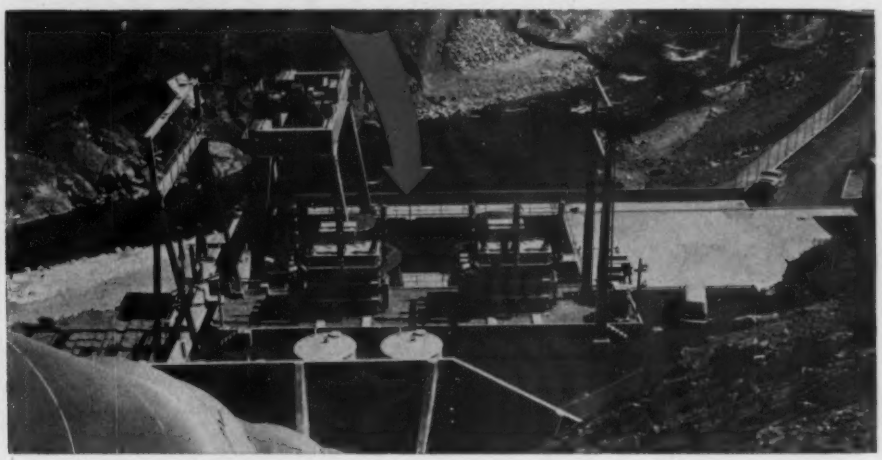
The hydro plant is built around two vertical, air-cooled, outdoor type generators, with direct connected exciters and magnetic amplifier type voltage regulators. Each generator has a continuous rating of 66,000 kva, 13.8 kv, at 98% power factor.

Two television cameras are installed at the plant, one indoor and one outdoor. Selection of either camera is made by supervisory control. The indoor camera is used for observing instruments on the control board and for taking readings that are not telemetered to the remote control station located at a nearby hydro plant. The outdoor camera, mounted on the parapet wall overlooking the generator deck, is used for surveying the general plant area and the penstock.

Each camera is equipped with a zoom-type lens as well as pan, tilt, and focus control units under the command of the operator at the remote station. The outdoor camera housing is also provided with a remote-controlled window wiper and heater for operation during adverse weather conditions. A TV monitor is installed at the hydro plant control room to test and adjust the cameras and associated equipment.

TV equipment specifications called for the "pick-up" of a usable 17-in. picture in an environment having a light level of only 5 ft-c the illumination provided by emergency dc lighting in the hydro plant control room. A usable picture for this particular application requires a 600-line resolution picture in which the numerals and scales of switchboard instruments are clearly discernable.

The problem of providing a remote control system that would meet the desired standards of reliability was resolved by installing microwave equipment having on-line, or "hot", stand-by. A wire line for the control functions was ruled out because of the distance separating the hydro plant from the remote control station. There was also a possibility of incurring a high ground potential difference between the two terminals of the 230-kv line, which are about 12 miles apart.



OUTDOOR CAMERA (arrow) on the parapet wall surveys the penstock and general plant area. Camera is equipped with window-wiper and heater for adverse weather

Unattended Hydro Plant

The two-way microwave path accommodates, through multiplexing equipment, supervisory control, selective telemetering, continuous telemetering, area load-frequency control, sound monitoring and two communication channels with provision for a third communication channel. Microwave path length is approximately 550 ft, utilizing two passive reflectors with a parabolic antenna at each terminal. An additional one-way microwave channel accommodates the closed circuit television from the unattended powerhouse to the attended remote control station.

Camera Watches Local Annunciator

Remote station supervisory control equipment provides 41 control selector positions, including 13 spares, four for continuous telemetering of speed and water flow, and two for selective telemetering of generator voltage, amperes, kilowatts and vars. There are also 14 alarm and indication positions including three spares. At the hydro plant, the local annunciator is built into the supervisory cabinet for observation by the indoor television camera in the control room.

Mammoth Pool plant is considered a "semi-automatic" station because each unit must be manually loaded by the operator or placed under area load frequency control. Following startup initiation by the operator, a unit will be sequentially and automatically brought up to speed and synchronized to the system. Four completely automatic sequences are provided to enable the remote operator to start-up or shut-down either unit as a generator, or to place either unit in operation as a synchronous condenser.

An automatic start sequence requires about 6½ min from initiation until the unit is on-line. An automatic shutdown sequence requires about 15 min from initiation until the unit is at rest with brakes applied. The remote operator visually follows the start or stop sequence as indicated by the lights on the remote supervisory control panel and, by the instruments on the televised control panel. Sound monitoring enables the operator to hear the scroll case filling or emptying, the release or application of the generator air brakes, acceleration or deceleration of the turbine, and closing or opening of the generator circuit breaker.

The operator is provided with independent remote supervisory control of operating functions and equipment, for remote-manual operation of the plant if required. Provision is also made at the hydro plant for local-automatic or local-manual control should the need arise.

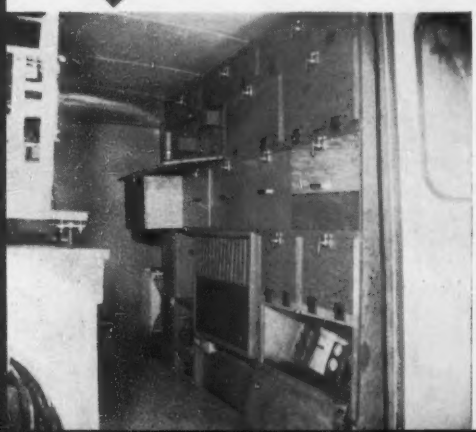
Mobile Relay Lab Beats the Weather

L. L. **WRIGHT**, *Electrical Engineer, Southwestern Electric Power Co, Shreveport, La.*

Relays are tested in four section test-all table

Leveling tray mounts relays for calibrating

Compact year-round heat pump uses little space



A testing laboratory, built into a ¾-ton Step-Van, now provides the proper environment and facilities to speed up relay checking at Southwestern Electric Power Co transmission substations. Furthermore, the relay tests are no longer subject to whims of weather conditions.

Shipment of relays to a central test laboratory was not considered desirable, because past experience had established that relays were often damaged in transit. Furthermore, this method of maintaining relays required a considerable investment in spare units. On the other hand, temporary assembly and disassembly of test equipment at each substation was not the solution to relay maintenance problems. Not only was this practice extremely time consuming, but more importantly, the weather often became a problem. For instance, at a substation with no control house, even the threat of rain was enough to call off a test, and dust was a constant headache.

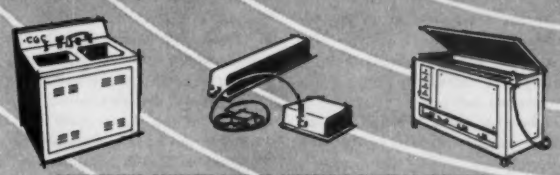
The solution to numerous substation relay maintenance problems was found in a mobile test laboratory, recently designed and built by Southwestern Electric Power Co. It contains testing equipment for all types of relays used in transmission substations. The relay to be tested is mounted in the proper section of the four-section test table. Each section can be mounted in a leveling tray for accurate relay calibration. Relays adversely affected by shock or vibration are mounted for protection in foam rubber-lined wells. The relay is connected to a plug which is in turn inserted into the proper test-circuit receptacle. The test circuits are controlled by push buttons from either of two locations to insure complete control by test personnel. Three-phase 115-v line-to-ground and 240-v single-phase power sources are available.

Ample space has been provided for spare parts, tools, instruction books and auxiliary equipment. A year-round heat pump maintains the efficiency of the test crew by providing a comfortable work climate—damp hands in the summer and numb fingers in the winter no longer slow down the work. Cost of the mobile unit, excluding the test instruments, was $5,150.

Test equipment in the mobile lab consists of relay cases, test plugs, multimeter, dc power supply, phase angle meter, timer, load boxes, ac ammeters, dc ammeters, ac voltmeter, variable auto-transformer, K-Dar test box, dial box, test resistor, reactors, phase shifter, and a Wheatstone bridge.

INTRODUCING THE ONLY SELF TUNING ULTRASONIC CLEANERS

Powertron's new line of self tuning ultrasonic cleaners CUT CLEANING TIME 300% over outmoded ultrasonic systems. Case histories on file show up to 900% faster cleaning consistently, and savings of $3,000 a month in labor costs – details on request.



POWERTRON'S COMPLETE LINE OF AUTOSONIC CLEANERS INCLUDES TANK MODELS, CABINET MODELS, IMMERSIBLE TRANSDUCERS, DEGREASERS AND COMPLETE PROCESS SYSTEMS.

The Autosonic by Powertron is the world's only full line of ultrasonic cleaners with the self tuning feature that assures you of consistent peak performance cleaning regardless of load changes, solution level, liquid temperature, solvent contamination, or operator inattention.

Powertron's unique feedback transducer senses the energy level in the cleaning tank and automatically tunes itself for maximum cleaning efficiency. Every change in operating conditions is sensed by the Autosonic transducer and is immediately compensated for to keep cleaning performance at its peak continuously without operator attention.

Powertron Autosonic cleaning systems are high power, heavy duty units, ruggedly constructed for continuous operation on any cleaning job—even those that other ultrasonic systems can't handle.

A single switch is the Autosonic's only control, so careless operation can't affect the rate or degree of cleaning. Because Powerton's advanced design has eliminated knobs, meters and moving parts, even mishandling, such as no-load operation, won't damage the Autosonic. Every Autosonic cleaner is unconditionally guaranteed.

Powertron's complete line of Autosonic cleaners includes tank models from 2 gals. to 100 gals., cabinet models, immersible transducers, degreasers and accessories, competitively priced and available from stock. Whatever you want to clean can be cleaned better in an Autosonic.

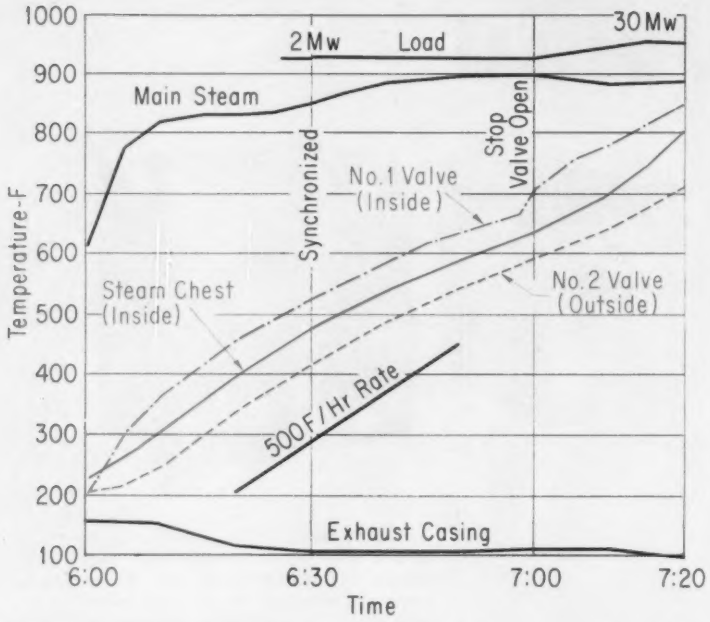
Powertron will be glad to show you how your cleaning problem can be solved Autosonically. Simply describe your application, or send a sample of the item you want to clean, and Powertron will send you proof that the Autosonic can increase your output, cut production time, and increase your profits. If you prefer, send for details on Powertron's free trial offer.

WRITE FOR FREE BULLETIN 60-1
"HOW TO CLEAN ULTRASONICALLY WITH SELF TUNING"

POWERTRON ULTRASONICS CORP.

DEPT. EW-8 PATTERSON PLACE • ROOSEVELT FIELD • GARDEN CITY, L.I., NEW YORK • PIONEER 1-3220

Develop Quick Start for Turbines



TURBINE METAL TEMPERATURES encountered with the new procedure show that turbines in frequent start-stop operation can avoid thermal shock

PAUL MURPHY, JR, *Assistant Supt,*
FRED G. CAMPAU, *Technical Engineer,*
HOMER W. DIEBLER, *Asst Plant Operations Engineer, Delray Power Plant, Detroit Edison Co, Detroit, Michigan*

A satisfactory start-up, heating and loading procedure for turbo-generators aims at elimination of severe cracking due to thermal shock. This procedure is being applied by Detroit Edison Co to turbo-generators that are started-up frequently.

The procedure is the result of six years of testing to solve the problem of severe cracking of valve chests and bowls due to the thermal shock of start-up and loading during daily on-and-off service and after week-end shutdown. This problem has affected 15 partial-admission turbines representing 1,200 Mw of capacity on Edison's system.

Important developments leading to the satisfactory procedure are: Redesign of No. 1 and 2 control valve cams to open both valves simultaneously; vacuum start-up with all control valves in the wide-open position; and heating of the turbine head-end with steam 500 to 600F higher than metal temperature.

The procedure was first applied at Delray Plant to an 1,800-rpm, 75-Mw unit with inlet steam conditions of 850 psi, 900F. Modifications to the 75-Mw unit included redesign of No. 1 and 2 control valve cams; installation of water sprays in the exhaust casing to control the casing temperature during the rolling period; and installation of small auxiliary valves in the vacuum breaker line to permit fine speed control for synchronizing, plus the use of an electronic speed indicator.

Specific steps in the start-up procedure are listed in an accompanying box. This procedure has these advantages over the practice recommended by the turbine manufacturer:

1. Steam at 500 to 600F above that of the metal can be used.
2. Pre-warmup of control valve chests is eliminated.
3. Inside-outside temperature difference of metal in valve chest and bowls is less than 150F.
4. Time to bring the turbine to synchronous speed and initial loading is reduced to about 20 min, with less attention required by the operators.
5. Start-up, heating and initial loading is done with all control valves wide open, thus obtaining full peripheral heating.
6. Turbine governor control, overspeed trip and throttle valve trip remain in active service.
7. Turbine speed is controlled to permit synchronizing by regulating condenser back pressure.
8. The unit carries 2 Mw of load during the heating period.
9. Steam flow is maintained through upper and lower valve chest during light load.

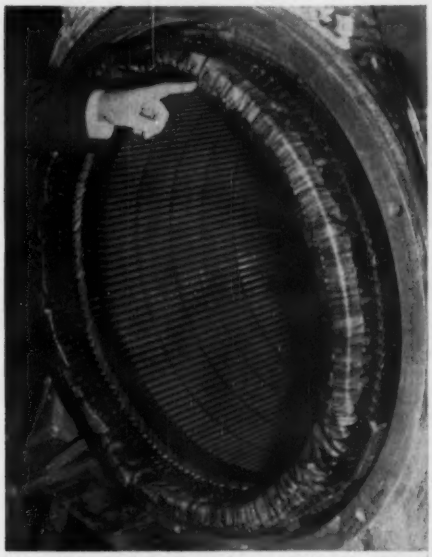
Procedure for Starting and Loading Turbines

1. With the unit primed, vacuum is held at 10 in. by bleeding air through the vacuum breaker.
2. Governor limit switch is placed in the all-raised full-load position; control valves are placed in the wide-open position.
3. Water sprays are turned on in the exhaust casing.
4. Turbine stop valve internal pilot is opened; steam is admitted through the wide-open control valve.
5. Vacuum breaker valve is closed to stop air bleeding; speed is allowed to rise with increase in vacuum.
6. Generator field breaker is put on at usual speed; disconnects are closed preparatory to synchronizing.
7. As turbine approaches synchronous speed, air bleeding is started (1,750 rpm) to level off speed and approach 1,800 rpm slowly. Air bleeding is closely controlled by regulation of the ½-in. and 1-in. valves in the vacuum breaker line.
8. When synchronous speed is reached the generator breaker is closed. Air bleeding is stopped and vacuum allowed to reach maximum obtainable. Water sprays are shut off in the exhaust casing.
9. Initial load (about 2 Mw) with control valves wide open is carried by steam passing through internal pilot. Length of this cycle will be determined by the temperature of the valve chest and bowls.
10. When the head-end temperatures reach 700F, the turbine is unloaded, valve chests are pressurized and the emergency stop opens. Loading then is done by regulation of control valves in the usual manner. During initial loading after opening of the stop valve, temperture limitations should not be exceeded in the valve chests, bowls and first stage.

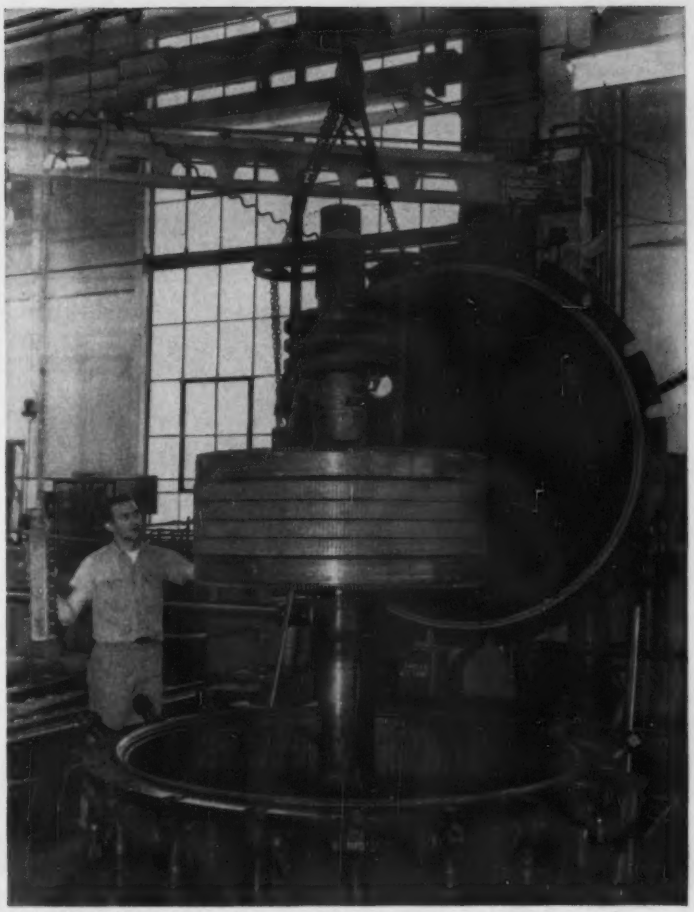
For maximum motor life...

NATIONAL VACUUM-IMPREGNATES THE COMPLETE MOTOR WITH EPOXY

National offers superb facilities for rewinding and rebuilding rotating electrical machines...such as this large vacuum tank used in impregnating insulations with super-strong Epoxy resins. Not only single coils, but complete rotor and stator assemblies for large motors are regularly handled in this equipment.



Complete stator assembly with NECCOBOND insulation system, after vacuum impregnation with Epoxy resins.



Rotor for 750-HP Motor is lowered into huge vacuum-pressure tank.

This process, used with the NECCOBOND insulation system provides these assurances of maximum service life:

- the insulation wall is completely void-free, with all interstices filled with resin to provide maximum heat conductivity.
- the exceptional mechanical strength and adhesion of Epoxy resin bonds the entire winding and core into a solid mass.
- uniform encapsulation provided by National's method of baking, insures high degree of protection against moisture.

Whether your electric coil and rebuilding needs are standard or special, you'll be sure of performance when you call in National Electric Coil. We tailor-make the coils to fit your needs, offer all types of insulation. For information call National's Columbus plant ...HUdson 8-1151...or check the nearest National field engineer.

SEE US AT THE Iron & Steel EXPOSITION SEPT. 27, 28, 29, 30 CLEVELAND, OHIO

NATIONAL COILS

National Electric Coil

COLUMBUS 16, OHIO • IN CANADA: ST. JOHNS, QUEBEC

DIVISION OF McGRAW EDISON

CIRCLE 99 ON READER SERVICE CARD

CONSTRUCTION

Stack-Mast Solves High-Lift Problem

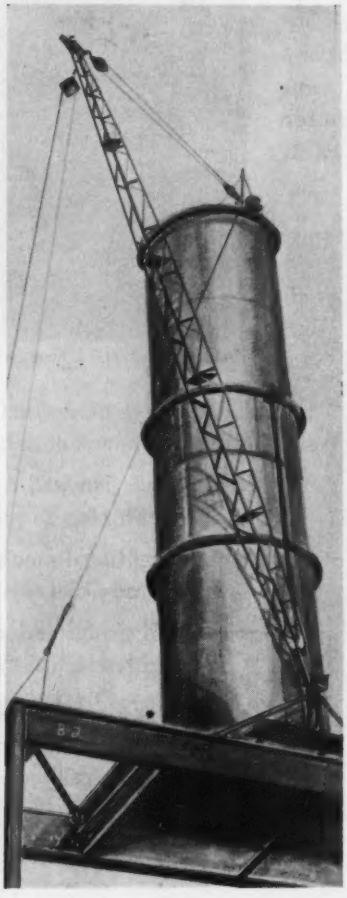
*J. **NEUMETZ**, Erection Engineer, Aerotec Industries, Inc, Greenwich, Conn.*

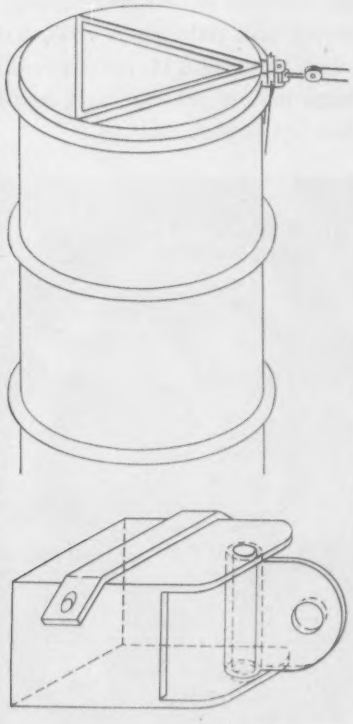
A mast rigged to a reinforced stack efficiently met the problem of installing a new precipitator atop the Werner Station of Jersey Central Power & Light Co. This unorthodox rig not only cut standard man-hour requirements for the job in half, but also cut boiler downtime by three weeks.

Installation of the precipitator 140 ft above the ground followed erection of steel framing and a new 45-ft high, 9-ft 10-in. dia stack atop the boilerhouse. Limited ground space alongside the plant precluded use of a transport-type crane for raising equipment into place. A 40-ft boom, rigged to reach out over the side of the building, had proved satisfactory for raising structural steel sections and other materials up to 40 ft above roof level. By anchoring the mast to the stack and lengthening the boom to 50 ft, the problem of raising heavy equipment above the 40-ft level was overcome. Although this hoisting arrangement had an ample safety factor, a prudent 3-ton load limit was observed.

Prior to rigging of the steel mast, the new stack was internally reinforced with welded 3 x 3-in. steel angle iron, particularly at the top. This reinforcing was removed after the job was completed. Steel guy lines were added to further strengthen the stack.

A mast-swivel, made from ½-in. steel plate, was welded to the top rim of the stack to permit swinging the boom through 180 deg. To allow the boom the widest possible swing over the work area, the base of the mast was supported on the steel framing, at a point well above the uppermost part of the in-place precipitator.





ANGLE-IRON FRAME reinforces stack (upper). Steel fabricated swivel swings boom through 180 deg

(More Construction on page 102)

New LAMPLIGHTER

(Series 15,000)

Sets a New Standard for Photoelectric Lighting Controls . . . Meets Every Industry Requirement in ONE Control!

Here is an all-new, dependable, accurate photoelectric lighting control. Engineered to meet the industry's own requirements, LAMPLIGHTER (Series 15,000) sets a new standard. Exhaustive tests, including tests under extremes of temperature, humidity, moisture, vibration prove LAMPLIGHTER'S superiority . . . prove it is skillfully engineered and of rugged construction. In ONE control, LAMPLIGHTER brings you — externally adjustable light level from 1 to 10 ft-c., surge and lightning protection, ample time delay, twist lock base to fit all EEI-NEMA Standard receptacles, exterior ridges for easier handling and installation. Fail-safe, completely weather-proof. Fuse protection optional. The Acme Wire Company also manufactures a complete line of accessories to meet any mounting requirement. Low initial cost plus long life and easy maintenance make LAMPLIGHTER *the* control to meet *your* specific needs. Write . . .

The Acme Wire Co.
Utility Products Division, Dept. MP-1
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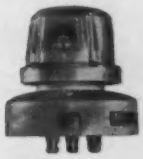
Luminaire or Slip Fitter Nipple Mounting

Luminaire Supporting Arm Saddle Bracket Mounting

Watt Hour Meter Socket Conversion Adapter

Adapter to Convert Form 110 Type Luminaire

Wooden Pole or Cross Arm Mounting



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Orlando's new plant . . .

Designed with steel to withstand 135 mph hurricane winds!

INGALLS FABRICATED MORE THAN 1,800 TONS OF STRUCTURAL STEEL FOR THE JOB

Designed for service, this new structure of Orlando Utilities Commission combines beauty with brawn.

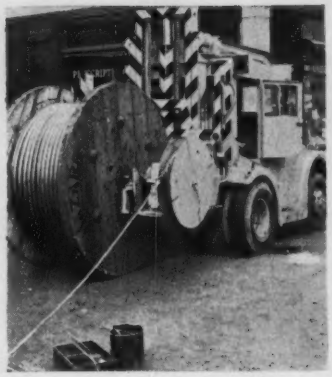
The beauty you see . . . the brawn you don't! It's there, all 1,800 tons of it, in the structural steel that frames the building. Steel supplies the strength to withstand the hurricane winds up to 135 m.p.h. experienced in the area. And Ingalls supplied the steel . . . fabricated to specifications and delivered on schedule.

Orlando Utilities Commission is but one of the 46 major power companies that specify steel . . . fabricated by Ingalls . . . for strength, precision, and economy. And, many specify The Ingalls Steel Construction Company for erection of the fabricated steel also.

Call or write for estimates on your next job.

INGALLS

THE INGALLS IRON WORKS / EXECUTIVE OFFICES: BIRMINGHAM, ALABAMA



Powered Reel Handler

*W. F. **AHLAND**, Engineer, Detroit Edison Co, Detroit, Michigan*

A mechanical cable reel handler developed at Detroit Edison simplifies the problem of pulling out old, or installing new, underground cable by minimizing the manual labor required. The handler is capable of "working" 10,000-lb cable reels, yet has good maneuverability for congested streets and alleys.

The vehicle is built around a 7-ton rated, Hyster fork lift. The original Hyster was driven by an operator facing the lift—the back wheels steered. However, changes to the lifting mechanism to ac-

Simple Device Holds

*CLAUDE A. **BELSHE**, Supt of Utilities, Colby Municipal Utilities, Colby, Kansas*

Handling of coiled messenger cable is simplified with the use of a simple pay-out holder devised and built by the author. The device prevents the cable from straightening out after the tie-wires are cut and allows the cable to be paid-out or re-coiled.

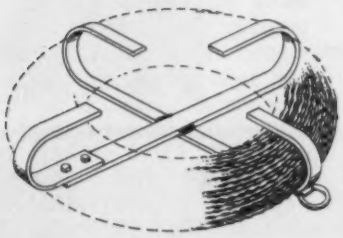
The holder consists of two pieces of flat iron with their ends bent to form half loops. The pieces are placed perpendicular to each other and welded at the centers. One end of one piece is removable to allow the coiled

Cuts Manual Labor

commodate cable reels, and the addition of a winch for pulling rope and coiling wire, obscured the operator's vision. The operator's seat and the steering handwheel were therefore reversed. Although the same two wheels steer the unit, front wheel steering and excellent vision is achieved for highway driving to the job site.

The operator parks the unit at the job-site manhole just as he would park a small truck—power steering eases the job. The cable reeler and the winch, powered by two new 5-hp hydraulic motor-pumps, can be operated from outside the driver's cab.

Coiled Cable



cable to be inserted into the holder. This end then is bolted to the holder. A loop of metal is attached to the holder for hanging on the service truck.

(More Construction on page 104)

SILENT HOIST

sets the pace again...

360° BOOM SWING—*Now . . . another addition to the famous family of Silent Hoist* **KRANE KAR** *. . . the original Mobile Swing Boom Crane!* **BOOM ROTATION:** *All-Hydraulic 360° continual rotation on heavy-duty double-race ball-bearing turntable.* **BOOM:** *15/22 ft., manual or hydraulic telescoping.* **TRANSMISSION:** *Hydraulic power shift directional in combination with flywheel torque converter* **STEERING:** *Full time power steering, finger-tip control.* **ENGINE:** *Heavy duty 6 cylinder valve-in head type.* **BOOM TOPPING:** *Horizontal to highest vertical in only 8 seconds.* **BOOM HOISTING:** *Load block 3 parts of line 25 to 55 fpm.* **TIRES:** *Dual pneumatic tires on traction axle for high flotation and extra blow-out protection.* **TOTAL VISION AND SAFETY:** *No obstruction in any position of load or crane; operator fully protected through 360° rotation of boom. Write for complete details in illustrated bulletin #99.*

180° BOOM SWING—*The Standard widely favored All-Hydraulic or Mechanical 180° swing boom crane models. Lifts, carries, and places any load up to 12½ tons. One engine powers the machine for travel and all crane applications—finger-tip control. Front traction wheel drive supports chassis and crane load. 2 geared speeds for hoisting, topping, and swinging. No tail swing—Boom never passes over Operator's head. Write for complete details in illustrated bulletin #79.*

SILENT HOIST & CRANE CO.
BROOKLYN 20, N. Y.

CIRCLE 103 ON READER SERVICE CARD

precision CONTROLS BEST

It's "Precision-eered"! Every part of the PMC fail-proof, miniaturized, trouble-free, 2-component multiple-control is your guarantee of quality that can't be matched.

Prove to yourself what more than 300,000 installations and an estimated 1,000,000 "light years" in the field have proved to other users of multiple-controlled lighting.

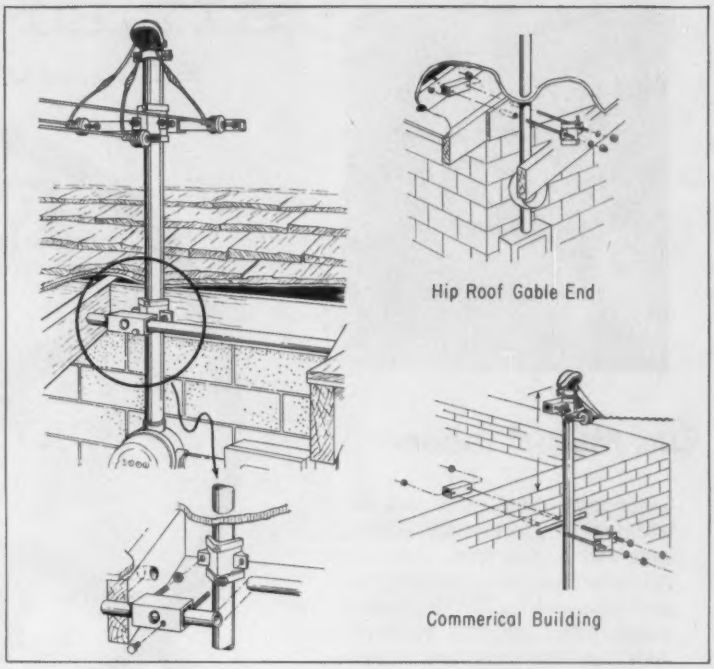
Specify PRECISION—to make *low first, cost your last cost!*

pmc **PRECISION MULTIPLE CONTROLS**

Pioneers in Automated Lighting Control

233 CHESTNUT RIDGEWOOD, N. J.

CIRCLE 62 ON READER SERVICE CARD



Mast Eliminates Service Pole

When connecting new service lines to homes, Arizona Public Service now rigs a mast directly to the house to eliminate setting a new pole. Furthermore, the house-mast arrangement increases the ground clearance by 3 ft. The service drop can be lengthened from 75 to 135 ft.

The house-mast assembly, built around a unique drop conduit brace, was developed by John Bales of the APS Service Audit Dept. The brace and related hardware are fabricated by the Universal Mast Equipment Co.

The service drop conduit brace consists of three basic parts: an angle clamp; a square slide; and a length of ¾-in. rigid conduit, called a brace bar. The angle-clamp straddles the mast. The square slide is assembled on the brace bar, which in turn is fitted into, and supported by, the house rafters. The square slide is positioned along the brace bar, in front of but separated from, the angle-clamp. Two bolts fitted between the slide and the clamp are then adjusted to force the clamp and conduit-mast tight against the frieze board of the house. A set screw locks the square slide to the brace bar. The mast can be installed with an open-end wrench and a drill.

The bracing assembly, referred to by the manufacturer as "Universal Service Drop Conduit Brace," provides the required support for a 1½-in. rigid service conduit riser 5 ft in length. The 5-ft length of conduit achieves a point of service attachment, 3 ft above the roof of a one-story building. The brace may also support higher masts by using 2-in. rigid conduit, providing not over one 10-ft length of the conduit is fitted in meter-socket or meter-can. Furthermore, the angle-clamp, when combined with a simple backing-piece, can serve to rig the mast cross arm in nearly any direction.

The mast-brace fits all standard gable roof rafters and can readily be adapted to fit gable roof ends, hip roofs with cornice molding, as well as many types of commercial buildings.

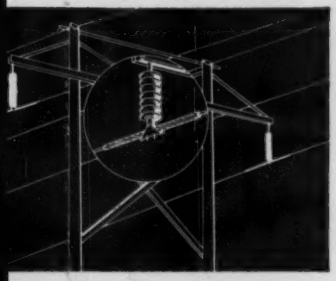
CIRCLE 40 ON READER SERVICE CARD

*Superformed** means better

ACCURACY • UNIFORMITY • GRIPPING

...*for* overhead line CONSTRUCTION, PROTECTION, REPAIRS

SUPERFORMING is an exclusive patented process for helical wire forming . . . *developed* by Fanner, the earliest commercial manufacturer of machine-formed armor rods . . . *formed* by special Fanner-designed machines with unequalled accuracy, freedom from surface damage or cross-sectional distortion . . . *tested* with specially-devised equipment simulating most severe operating conditions . . . *backed* by an organization which has built on Integrity, Service and Quality . . . *SAVES MONEY* because application is fast, simple, requires no tools . . . reduces maintenance . . . extends service life of conductors. That's why *more and more utilities are using more and more Superformed Products.* A-1429A

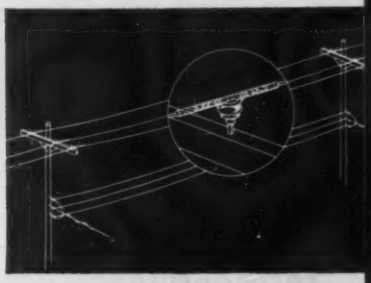


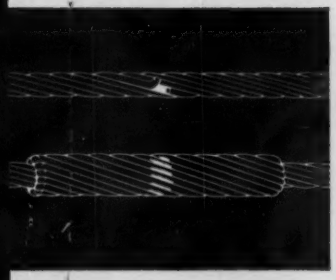
◀ ARMOR RODS

Protect against wind-induced and resonant-frequency conductor vibration at supporting points.

LINEGUARDS ▶

Protect at support points (and taps) in urban distribution where short spans are common; smaller wire sizes and shorter length than Armor Rods.



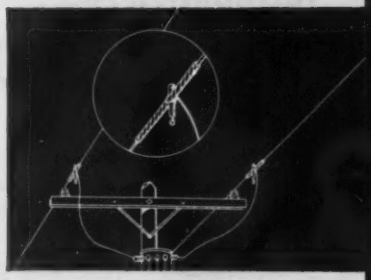


◀ PATCHRODS

Repair damaged or broken (up to 25% of strands) conductors, too far from support for Armor Rod to protect.

TAP ARMOR ▶

Protects where taps are required beyond extremities of Armor Rods on long spans or un-armored conductors.

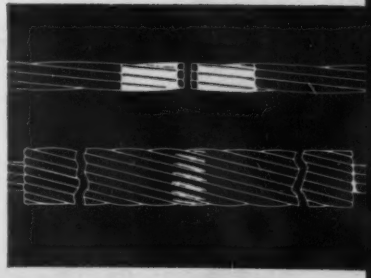


◀ FANNGRIPS

Provide ideal dead-ending and splices for wires, strands or cables for: Guys, Conductors, Multiplex Cables, Come Alongs, similar uses.

FANNSPLICES ▶

Join two ends of wire, or restore damaged conductors to original strength.



PLASTIC PRODUCTS FOR CONDUCTOR PROTECTION

Kover-Gard Ground Wire Moldings . . . Plastic Fannguards . . . Rigid and flexible Insulating Tubings.

For field or factory application, wherever there is a real need for surface covering.

STOCKS . . . SERVICE

Fanner Superforms are sold and serviced nationally by 22 Manufacturers' Agents in 34 locations. Stocked by electrical distributors from coast to coast.

PACKAGING

Superformed Products go to you in pre-packaged sets . . . the correct number of rods, centermarked with identification. Also supplied in bulk.

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Fine Fanner Superformed Products

THE FANNER MANUFACTURING CO.
Brookside Park • Cleveland 9, Ohio
Electrical Products Division

Licensed for use under or made in accordance with one or more of the following patents: Patent No. 2,587,521, 2,760,478, 2,588,963—Other patents pending.

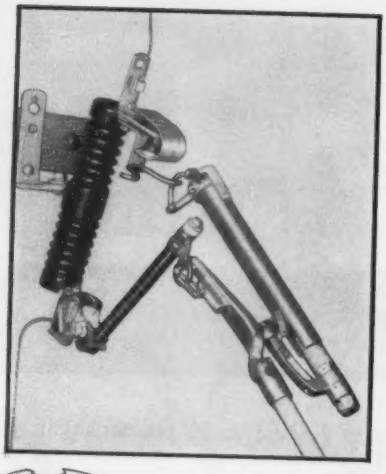
APPLICATION DATA

Specification and ordering are made easy by Fanner Superformed Products Catalog EP-8. Contains 48 pages of Selection, Application, Installation information.

CIRCLE 105 ON READER SERVICE CARD

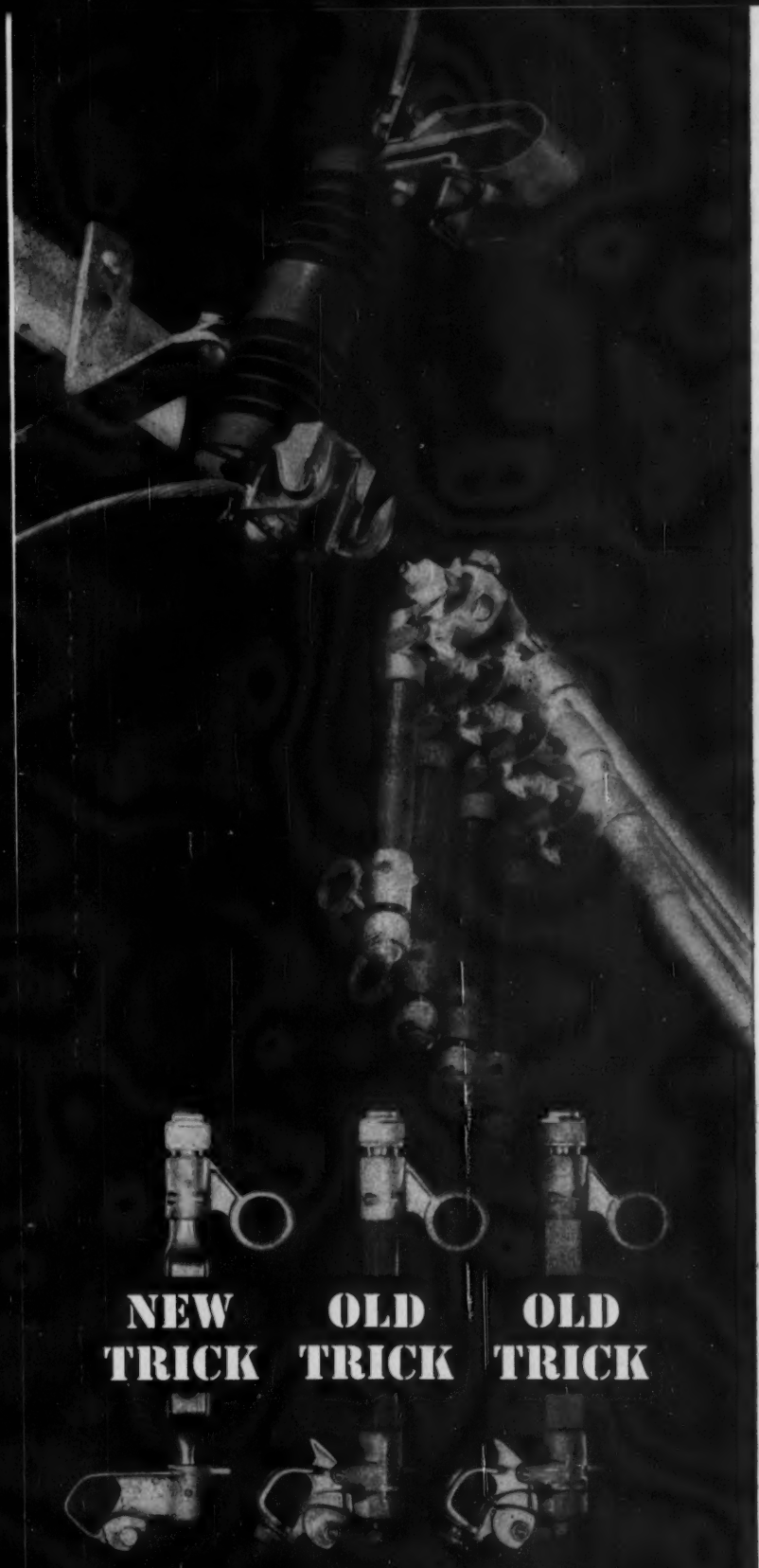
TEACHING AN OLD CUTOUT NEW TRICKS

(The secret is retroactive interchangeability)



S&C's Type XS Open Cutout not only learns new tricks with fuse tubes (illustration, right), it also works with Loadbuster, S&C's portable loadbreak tool.

NEW TRICK
NEW TRICK
Heavy Duty Fuse Tube
200 amps continuous
12,000 amps interrupting (7.2 kv)
Ultra Heavy Duty Fuse Tube
100 amps continuous
12,000 amps interrupting (five-shot rating, 7.2 kv)
14,000 amps interrupting (one-shot rating, 7.2 kv)



You can uprate S&C open cutouts, now or any time, for:

1. More continuous current capacity
2. More interrupting capacity
3. Full load switching

Teaching old cutouts new tricks is easy and inexpensive if they are S&C Open Cutouts—Type XS. "Retroactive interchangeability" means you can uprate your XS cutouts now in service or the ones you plan to purchase as your system grows. All you do is insert the new higher-rated fuse tubes or disconnect blades. Five different ratings fit the same mounting.

For example, if your Type XS cutouts are rated 100 amps continuous and 5,000 amps interrupting (at 7.2 kv), you can uprate them to 200 amps continuous and 12,000 amps interrupting as quickly as a lineman can change the fuse tube. You can change to any of the other ratings or styles just as quickly.

When S&C developed these new fuse tubes, they designed them to fit the cutout mountings already in service all over the country. Whether you uprate or not, S&C XS cutouts provide reliable interruption of the heaviest faults with minimum exhaust blast. And it does all this with *single venting*. Interrupting capacities are high enough to meet every fault condition on a typical feeder. And, because the XS can be used with Loadbuster (S&C's portable loadbreak tool), loads up to 300 amps can be repeatedly interrupted to give economical load switching.

If you want retroactive interchangeability in your open cutouts, contact:

S&C ELECTRIC COMPANY

4421 Ravenswood Avenue • Chicago 40, Illinois

Specialists in High-Voltage Circuit Interruption since 1911

S&C

CIRCLE 107 ON READER SERVICE CARD

High-Voltage Portable Stick Tests Ac or Dc From

WILLIAM J. MORRISEY, Staff Assistant, Substation Operations, Consolidated Edison Co, New York, N. Y.

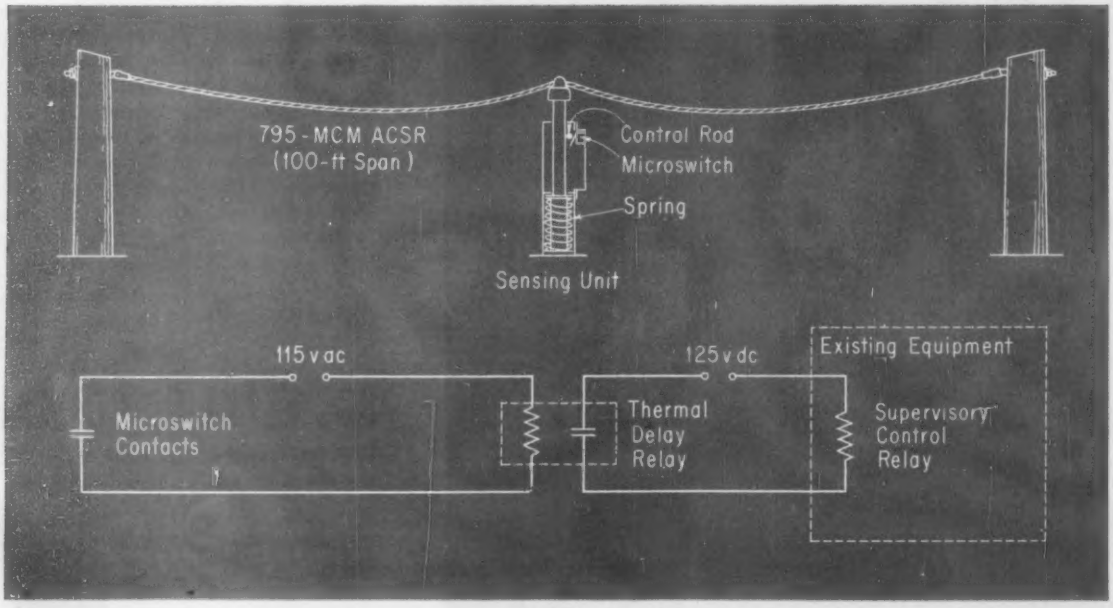
A high-voltage, portable test stick used by Consolidated Edison Co of New York detects potential before application of protective grounds, switching operations, removal or replacement of high-voltage fuses, or work on or near exposed current-carrying equipment. In stations where multiplicity and similarity of equipment could lead to errors in locating a working point, the stick tests all exposed copper before any work proceeds.

The device is current-limited; a guard keeps the operator's hands away from the high-voltage portion. A grounded metal cylinder in the handle shunts leakage current safely to ground.

This instrument detects 25 and 60-cps ac and positive and negative dc voltages. It has a testing range of 600 v to 50 kv. Visual indicators draw energy from a source other than the circuit tested. It is "fail safe," as there is a means for indicating that a part is not working properly.

Developed by Con Edison in conjunction with Commercial Electronics Co, the test stick uses a cold cathode Thyratron tube which is always ready for use, but passes current only when in use. Its power supply is a small battery. A glow from the Thyratron

System Warns of Ice Buildup on



600 V to 50 Kv

and a full-scale meter indication are obtained for all ac and dc voltages within the test range. The stick lasts almost indefinitely; the battery needs only yearly "shelf-life" replacement.

In use, the device continuously flashes a warning light and gives a full-scale meter indication that the test probe is in contact with a live circuit. The device is equipped with a sensitivity control, which permits indications of potential before actual contact is made to a live conductor, or when in the insensitive condition requires more than 35 kv to fire the tube if the probe is 3 in. away from the conductor.

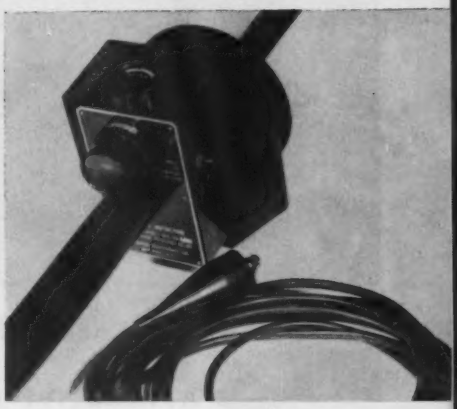
The tube's cathode, acting as a light source, has a life of more than 30,000 hr. The tube itself amplifies currents drawn from the high-voltage conductors to a value that causes its cathode to glow. The shock resistant meter is connected to an extinguishing network so as to permit the light to function even when the meter is open-circuited.

The meter's deflection is practically independent of the voltage tested, a large swing being obtained for all voltages within range. When new, the battery in the grounded metal tube of the handle has a voltage of over 155 v. It is designed for intermittent use over a long period.

The stick can be used as a microammeter for a clear check on station equipment whose cables are short and of low capacitance. Besides showing that equipment is dead, it determines whether it is clear of ground. In testing an open disconnect to check whether protective grounds have been removed and whether it can be closed safely, this procedure is followed:

The stick's ground lead is attached to a good ground. The probe contacts the open blade of the disconnect switch to prove that it is dead. The check switch on the stick is operated to cause the indicator to light and the meter to indicate. While the tube is lit, the stick contacts the open blade again. When the protective ground has been removed and the switch is open, the light remains lit or relights immediately. When the ground has not been removed, the indicator light remains out. When the feeder switch is left closed without grounds on either side, the light goes out also due to capacitance of the feeder cable.

CIRCLE 109 ON READER SERVICE CARD



Transmission Lines

A. E. ETHRIDGE, *Engineer, Texas Electric Service Co, Ft. Worth, Texas*

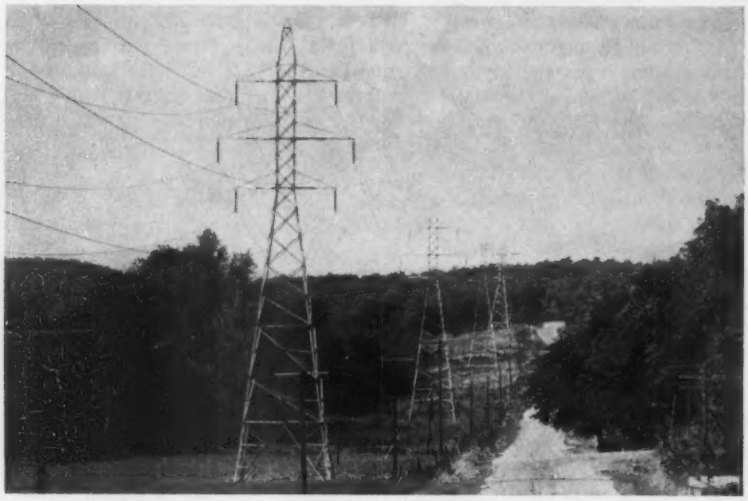
To warn of approaching icing conditions on transmission lines, operating engineers of Texas Electric Service Co pooled their ideas and built an ice warning device. The warning device simulates transmission system conditions with a 100-ft span of 795-MCM ACSR anchored at each end to 6-ft stub poles. The sensing device is in the center of the span.

The conductor is supported by a rod which acts against a coil spring in a cylinder. When ice begins to form on the 795-MCM conductor, the spring deflects due to the added weight of the ice and moves a trip rod to operate a microswitch. Closing of the microswitch contacts energizes the thermal element of a thermal time-delay relay. After 2 sec the time-delay relay contacts close to energize a supervisory control relay to transmit an alarm signal to a remote dispatcher's office through an existing communication channel.

Design of the sensing unit provides a variety of adjustments for calibration. Tension in the 795-MCM conductor can be changed; relative positions of trip rod and microswitch can be varied. The time-delay relay prevents the initiation of an alarm signal by conductor movement resulting from wind. Although transmission of a false alarm due to the weight of birds on the conductor is possible, the probability of birds on the line during icing is slight.

FLINT

DISTRIBUTION AND SWITCHING SUBSTATIONS



Always Include:

- ATTRACTIVE PRICE
- BEST QUALITY
- LOW TRANSPORTATION COSTS
- DELIVERY RELIABILITY
- COMPLETE ENGINEERING SERVICE

ALSO: Fabricated Steel Plate
Fabricated Galvanized Steel
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Steel Service Center

We Invite Your Inquiries

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P. O. BOX 1289 · LU 4-3621...TULSA 1, OKLAHOMA
MEMPHIS, TENN.

Infrared Thaws Frozen Coal Cars

B. M. LYONS, Sales Representative,
J. L. LUND, Sales Representative,
Cleveland Electric Illuminating Co, Cleveland, Ohio

Cleveland Electric Illuminating Co has drastically reduced cold-weather coal car unloading time and costs, and eliminated car damage at their Avon Lake Generating Plant by installing an electric infra-red thawer system. Specifically, the unloading chore was reduced from a six to one-man operation; the operating cost of the heaters was reduced by 70%; and by avoiding paint scorching from open flames and the car "bumping" normally associated with a 16-lb maul, car damage was eliminated. Furthermore, these gains were achieved with 20% less initial investment than would be required for steam or fuel-fired thawing equipment.

The infra-red thawing elements are of unitized construction to resist the severest types of mechanical and thermal shock. Each element, designed with individual wiring and conductors, is portable so that it can be independently moved and stored.

An aluminum shed, 20x100-ft with a height of 16 ft, spans the track leading to a rotary dumper. Units for side and bottom thawing are located in the first 50 ft of the shed. Bottom heating elements sufficient to cover one car are located in the last 50 ft. Connected load is 2,268 kw.

In operation, a string of cars is pulled into the first 50 ft of the thawing shed. The infra-red units are turned on and adjusted to the thawing requirements. After five minutes in the heating section, the string of cars is moved up to the second 50 ft of the shed where the bottom units are energized. After five more minutes, the first car of the string is moved into the rotary dumper and charged to the coal bunkers. The five minutes on the 30-year-old dumper is the limiting factor in the thawing cycle. The dumper has operated with minimum maintenance over the

years and it is considered adequate for Avon Lake Station.

After the first car is dumped, the second car is moved into the dumper, then the third, and so on in succession. Thus each car receives five minutes of combined side and bottom heating and five minutes of bottom heating.

Energy consumption varies with the frozen condition of the cars, the type of coal and the ambient temperature and wind conditions at the time of thawing. Average energy use for the first season of operation is expected to be 170 kwhr per car.

The thawer is controlled at one master control station by the car spotter. A master selector and a thawing time switch is used to energize sides and bottom, for a specific time duration, as required by the thawing conditions. One push button initiates the thawing cycle and the control panel is not manned again until a different thawing cycle combination is required.

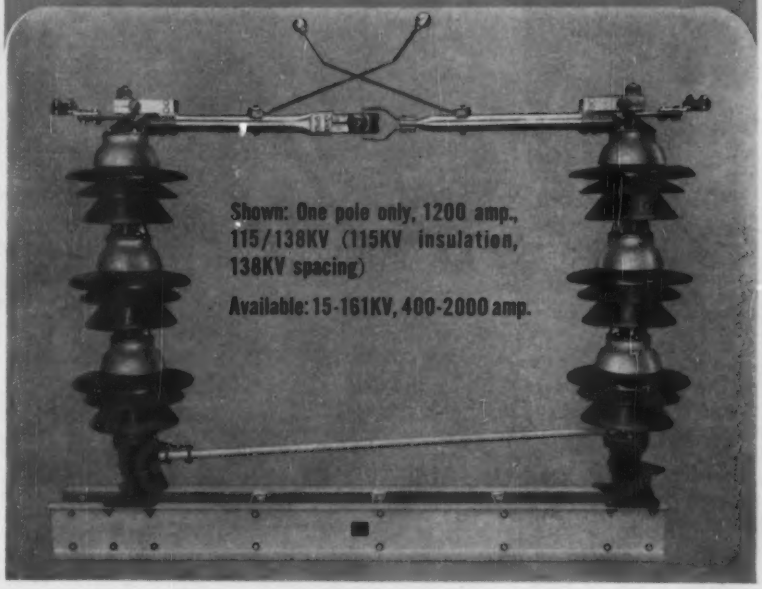
Maintenance of the infra-red heaters has proven to be exceptionally low due in part to the fact that they can be hosed down with water, steam or air while in operation. Bottom units require more attention than side units.

To guard against damage from infra-red heating, air hoses on the railroad cars are protected by simple asbestos boards fitted with flexible hangers. The route boards and tags are protected by simple slip-on metal shields.

The dumping cycle will be speeded up by the addition of vibrators mounted on the car clamps. This will allow the car thawer to be used to its maximum capability.

USCO TYPE GCH-3

The center-break switch that offers ECONOMY with ENGINEERING QUALITY



Yes...you can cut line & station construction costs & still get the best!

Design engineers throughout the country are adopting the new USCO GCH-3 as standard. They report that the GCH-3 not only meets the strictest engineering requirements, but that it wins the praise of budget-conscious management. More and more utility companies are getting GCH-3 economy and quality*. Check advantages listed below and see how you can do the same!

- Cost savings up 14%
- Extremely simple to install
- Very easy to operate
- Exceeds NEMA Specifications
- All fastenings thru-bolted, insuring adjustment
- High pressure contacts, even in the line-swings
- Functions perfectly in any mounting position
- Base mounting holes drilled to your specifications
- Terminals furnished to your specifications
- Your choice of make and type of insulators

Include the GCH-3 in your next switch study ... send your inquiry to USCO today!

*Names furnished on request

USCO Power Equipment Corp.

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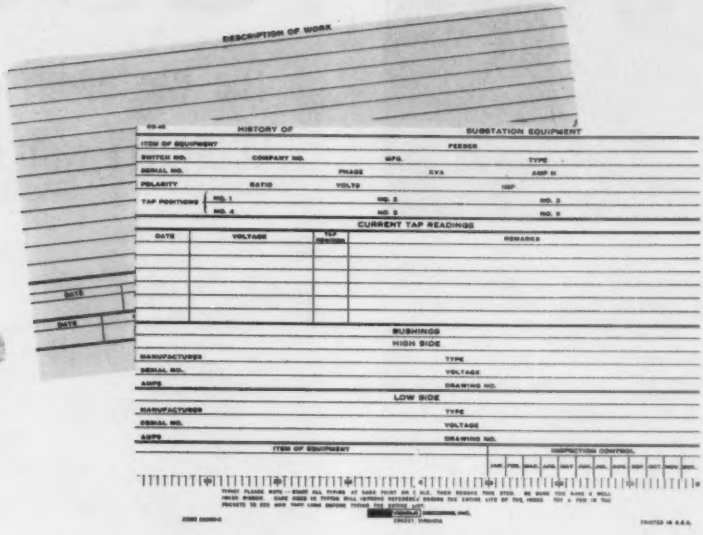
Designers and Manufacturers of High Quality High Voltage Equipment

CIRCLE 111 ON READER SERVICE CARD 111



Area Engineer Controls Substation Maintenance

JOHN D. HARRIS, *District Engineer, Gulf Power Co, DeFuniak Springs, Florida*

The Pensacola District Engineering Dept of Gulf Power Co has developed a method for substation maintenance controlled by the area substation engineer. This new system minimizes file space and clerical work requirements while providing a permanent, up-to-date and easily accessible equipment reference.

Visual-index cards are the heart of the system. Three types are used: a permanent history card for each piece of equipment; a companion work report card for each piece of equipment; and a history card for protective fuses. These cards were designed with the assistance of Acme Visible Records, Inc.

The 8x5-in. permanent history card contains all descriptive information on the particular piece of equipment, the name of which is displayed on the margin of the file. In addition, two specific control features are achieved with this card: (1) a colored celluloid strip of varying length is inserted horizontally in the lower right margin flap to indicate the last month in which maintenance was performed; and (2) three small celluloid strips of different colors are positioned over the bottom edge of the card to establish the circumstances of equipment maintenance. Thus, when the tray is opened, the area engineer can easily see whether total, partial or no outage is required for the maintenance check.

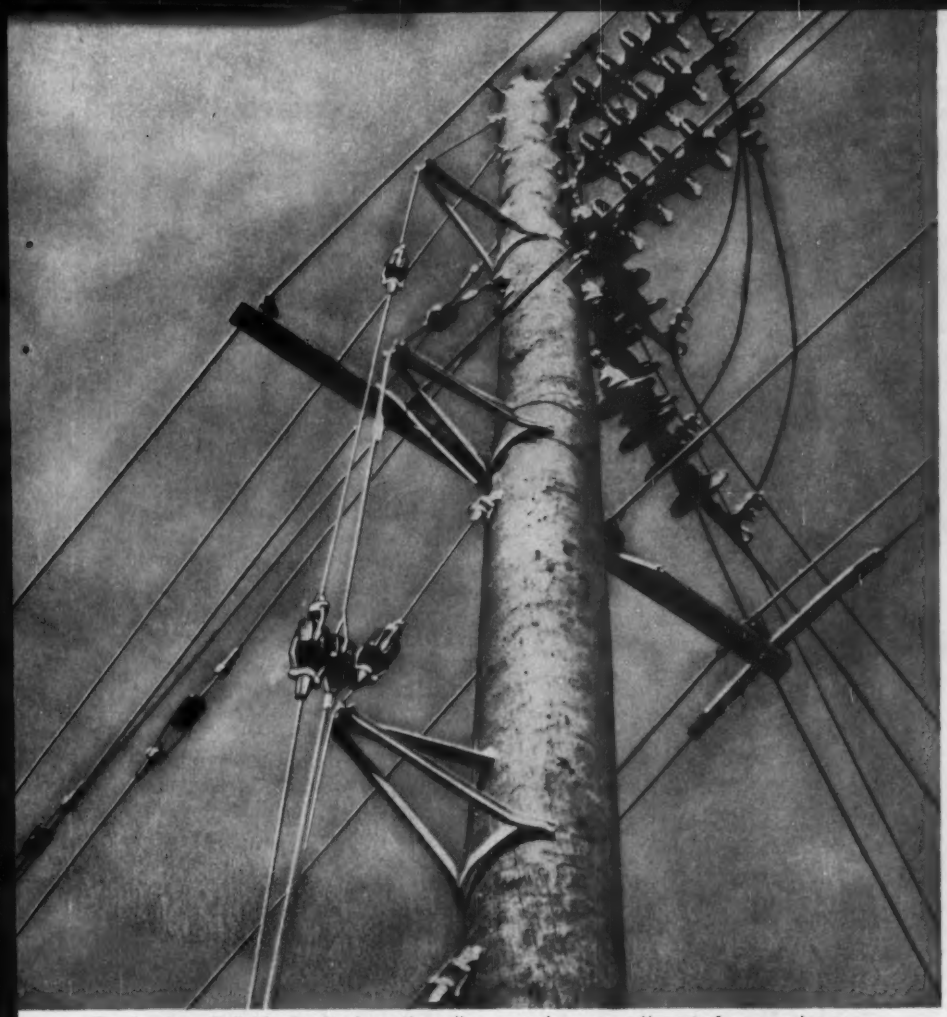
The 8x4½-in. hinged work report card is paired with each permanent history card. The front of the work report card provides for a brief description of the piece of equipment, plus space for a report of oil testing. The back of the card provides space for the foreman to report the description of the work performed. This card is positioned in the file tray so that when a particular permanent history card is referred to, the back of the related work report card is in view just above.

The protective fuse history card provides a complete description of all fuses used in the substation, with a specific reference to the equipment protected thereby. This card contains space for the name of the substation at the bottom margin. It is the first card in the top tray of the file-cabinet.

To use this maintenance control system, the area substation engineer sets up an equipment maintenance-check schedule by transferring the pertinent hinged work report cards from the file cabinet trays to either of two portable filing books. These filing books are made up of metal binders so that the foreman can, after the maintenance check has been completed, write his report on the inserted card without removing it from the binder.

During the time that maintenance on the equipment covered in the first book is being performed, the area engineer prepares the second for additional pieces of equipment. The second book is not placed in the foreman's hands until the first book has been completed and returned. When a book is returned, the work report cards are returned to their proper place in relation to their companion permanent history card. The maintenance control signal strips are then adjusted.

(More Maintenance on page 114)

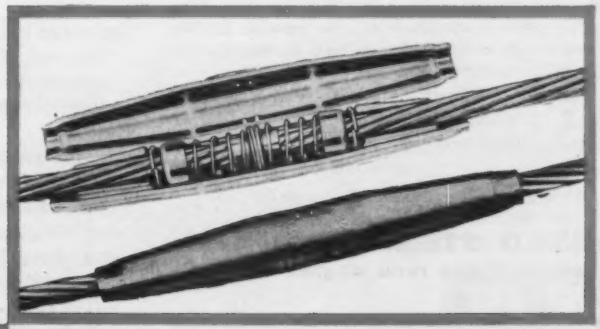


The fourteen Reliable deadends on these lines saved someone three to four man-hours.

TO THE EXECUTIVES IN CHARGE OF SAFETY... AND COSTS

During more than 25 years of continuing production, it has never been reported that a Reliable Feed-Thru Deadend chuck let go a line.

Feed-Thru Deadends are ideal for all working conditions. There are no special tools, no nuts, no bolts, no keepers . . . when the work is "hot" they get your men off the lines in the least possible time.



Reliable produces splices that perform like two deadends back-to-back. The conductor feeds completely through the chuck until it reaches the built-in center barrier.

Reliable

ELECTRIC COMPANY • FRANKLIN PARK, ILLINOIS

A Symbol of Integrity Since 1909

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SAFETY by-the-MILE

with CF&I Galvanized Steel Strand

CF&I Galvanized Steel Strand used as overhead ground wire safeguards your power cables all along the line. It takes the punishment from lightning and shunts it harmlessly aside.

This kind of safety is inherent in every foot of CF&I Galvanized Steel Strand. The wire is expertly drawn from selected steels. After the wire is hot-dipped in zinc for extra weather resistance, it is stranded. The quality controls used in each manufacturing operation assure a strong, safe, dependable grounding wire.

For standard applications, CF&I Galvanized Steel Strand is made to ASTM specification A-363 in seven- and three-wire constructions. For special applications CF&I is equipped to manufacture strand to your own specifications.

For complete details and delivery schedules, contact your local electrical distributor.

7768

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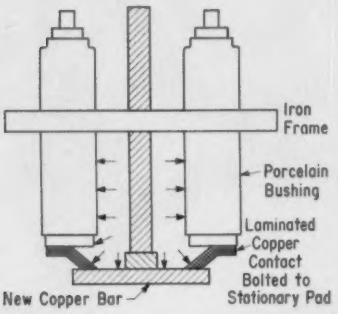
New Contacts Uprate



***W. H. MEADE**, Division Head, Engineering and Construction Dept, Boston Edison Co, Boston, Mass.*

Boston Edison Co is increasing the short-circuit current capability of 4-kv, 300-amp oil switches by making the mechanical forces developed in the energized switch add to, rather than detract from, normal contact pressure. Furthermore, because the size of the modified switch remains the same, no alterations in manholes or related enclosures are required for the switch.

Need for the modification arose when recent tests showed that the original 4-kv, 300-amp underground switch, rated at 10,000 amp for 10 cycles, should now have a momentary current capability in excess of 20,000 amp. High-current short-circuit tests revealed that strong me-

Machine Cleans

***LEONARD K. KANE**, Mechanic General Foreman, Construction and Maintenance Dept, Detroit Edison Co, Detroit, Michigan*

Turbine casing bolts are being cleaned faster and easier by Detroit Edison Co's Construction and Maintenance mechanics with a motor-driven cleaning device developed in the shop.

The device consists of a pair of ball bearing rollers to support the turbine bolt to be cleaned; a mandrel equipped with a rubber drive-wheel to spin the bolt; and, a reversible electric motor,

4-Kv Oil Switches

chanical forces were being exerted by the heavy current on the switch contacts.

The stresses are show by arrows in the illustration. These mechanical stresses, created by the flux pattern around the conducting members, exerted pressure against the laminated bridge. When sufficient current was flowing, this pressure tended to straighten out the laminated bridge and open the contacts.

To make these mechanical forces work to add to the contacting pressure, the end sections of the laminated bridge were cut and bolted to the stationary pads. A new bridging member was made from a solid copper bar.

The original laminated bridge was used in the modification because it was apparent during the tests on the original switch that it was maintaining proper contact pressure and providing the necessary "wipe" action.

Exhaustive tests on the modified switch showed that the momentary current capability of the original switch could be increased to something in excess of 25,000 amp without affecting its other characteristics. Now the rating of the switch is a function of the current-carrying capacity of the contacts and other components, rather than of the imposed mechanical stresses.

Turbine Casing Bolts

geared down to 193 rpm, to turn the mandrel drive-wheel. The mandrel and motor are separately hinged to accommodate bolts of various diameters.

The bolt is placed on the ball bearing rollers, and the rubber drive wheel is adjusted for slip-free operation. Two men wire-brush the threads and body of the bolt as it is rotated. The device minimizes the work involved in preparing turbine casing bolts for magna-glo-inspections.

(More Maintenance on page 116)

TOP PHOTO: New White Way—White Plains, New York
LOWER PHOTO: Traffic circle illumination—West Miami Springs, Florida

P&K ALL ALUMINUM

LIGHTING STANDARDS & DAVITS

More than just modern-looking, P&K street lighting standards are modern in total concept. Compare our use of functional design . . . no scrolls, no tie rods . . . instead a strong aluminum tapered elliptical arm – one piece for minimum inventory, fastest assembly and installation. Compare the P&K davit, truly the ultimate in functional design with a style as fresh as tomorrow. What's more, P&K is modern in the materials of construction: to the inherent strength and light weight of aluminum, P&K has engineered designs to meet every load requirement—from the conventional incandescent and mercury vapor luminaires to the new, larger and heavier models in both mercury vapor and fluorescent. And above all, P&K is modern in its elimination of maintenance problems. No painting required—ever. Even the salty sea air offers no hazard to the good looks of P&K standards.

For more information reserve your copy of the new Aluminum Lighting Standards catalog now. Ask for our helpful brochures ALS and BR-11.

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The measure of Success

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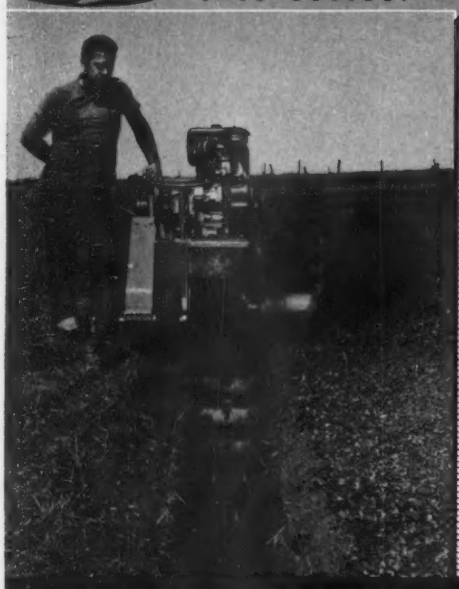

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COMPARE

SIZE: DIGS FROM 4" TO 16" WIDE AND UP TO 6' DEEP

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LIFE: AS HIGH AS ½ MILLION FEET!

EASE OF OPERATION: See a demonstration! CALL COLLECT!

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CIRCLE 63 ON READER SERVICE CARD

New "Inverted Housing" On HD MAX-I-METERS...

Assures Accurate Meter Dial Readings From Ground Level!

Newest design in primary voltage ammeters—the "Inverted Housing" of HD's MAX-I-METERS is designed to face directly downward or towards ground level. This new "inversion" feature results in substantial labor and time savings for all utilities.

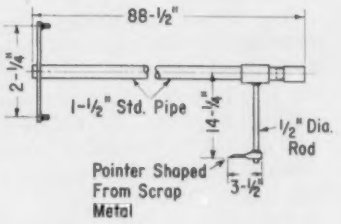
Here's why: After initially installing MAX-I-METER, your operator can read, either with eyes or optical support, the instrument's scale from ground level. Operator does not have to "gear-up" or climb into primary voltage area. Also minimizes hazards involved whenever operator must climb up to primary voltage area.

New "face down" position or "inverted housing" feature is immediately available on virtually all MAX-I-METER models. Exclusively offered by HD.

Write for complete data and pricing today.

HD ELECTRIC COMPANY Deerfield, Illinois

Gage Speeds Up Mill-Spider Alignment



O. A. HESSON, *Maintenance Foreman, Cabin Creek Plant, Appalachian Power Co, Cabin Creek, W. Va.*

A special alignment gage makes the re-assembly of pulverizer mill-spiders easier and reduces re-assembly time by about 48 man-hr per year for each pulverizer overhauled.

Each of the eight conical pulverizers has two inlet spiders. Alignment of a spider during reassembly is extremely critical and also very difficult to attain. In the past, most reassembly time was spent measuring and adjusting spider support bolts to obtain the

Two-Piece Protector

W. D. GALLOWAY, *Maintenance Foreman, Kyger Creek Plant, Ohio Valley Electric Corp, Gallipolis, Ohio*

Two-piece design of tube protectors for cross-tube burners can save many man-hours whenever the protectors are replaced during a boiler overhaul or scheduled outage. Removal and installation of a complete set of these split protectors takes about 80 man-hr compared with 1,100 man-hr required in the past.

center line through the mill and classifier tube.

The problem was solved with a special gage to align the bolts. One end of the gage, made from 1½-in. standard pipe, is bolted to the exterior opening in the classifier tube. Near the other end of the gage is a movable pointer that can be revolved to establish the center line of the mill.

When the pointer follows the circumference of the trunion tube, its pivot point is centered and the correct spider position is established. The spider bolts can then be tightened and their lock nuts welded in place.

Aids Replacement

Replacement of one-piece protectors called for the removal of secondary air dampers and their actuating arms and weights. Then the damper casings, tube-protector bolts and protector support plates had to be removed. For the 288 protectors in a single boiler, this amounted to more than 1,100 man-hr.

Following the conception of a split design for a tube protector at Kyger Creek Plant in 1957, improvements were made until the present design was evolved. The protector consists of two pieces of Ni-Hard material cast in separate molds. The larger piece is drilled and taped. The two pieces fit around, dovetail and interlock around the burner tube. A ¼x1½-in. socket-head cap screw inserted through the smaller piece may be tightened easily with a small hex-head (Allen) ratchet key.

The new Model K pull-type Spinner was designed especially for power cables, with a background of many years' experience in telephone cables. It has been adopted as standard by many electric utilities.

- Lashes three cables as large as 2" O.D. at one time.
- Lashes single cable as large as 3½" O.D.
- Lashes with one or two lashing wires.
- Lashes with wire of any type or size.
- Works on any size strand.
- Weighs only 36 pounds (less wire).

For descriptive information and application data please drop us a note.

CABLE SPINNING EQUIPMENT CO.

3100 Topeka Ave. Topeka, Kans.

Phone CE 2-7234

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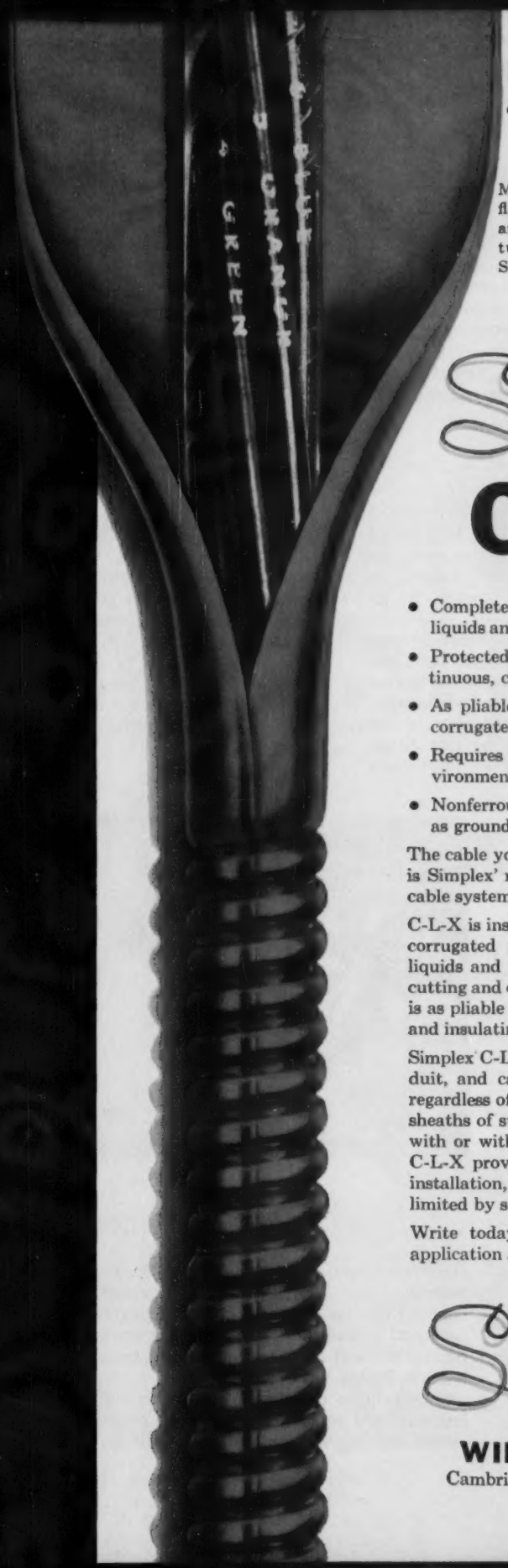
Only Simplex C-L-X . . .
the Completely Sealed
Cable System . . . is Built
for Torturous Conditions
Like This



Simplex C-L-X combines cable and duct in one integrated system

Metal, in the form of a continuous flat strip, is formed into a welded tube around the insulated cable. The metal tube is then corrugated to form Simplex C-L-X.

Simplex

C-L-X

- Completely sealed to prevent penetration of liquids and gases.
- Protected against mechanical damage by a continuous, corrugated metallic sheath.
- As pliable as unsheathed cable because of its corrugated design.
- Requires no separate duct or conduit in any environment.
- Nonferrous sheaths can be designed to function as grounds or shielding.

The cable you see here is *not* interlocked armor. It is Simplex' new C-L-X . . . the completely sealed cable system.

C-L-X is insulated cable enclosed in a continuous corrugated metallic sheath. It is impervious to liquids and gases, is highly resistant to crushing, cutting and other forms of mechanical damage, and is as pliable as unsheathed cable of the same size and insulating compound.

Simplex C-L-X requires no separate duct or conduit, and can be installed in a continuous run regardless of the number of bends. Available with sheaths of steel, aluminum, copper or bronze, and with or without outer plastic jacketing, Simplex C-L-X provides the ideal solution for almost any installation, particularly those in which cable life is limited by severe ambient conditions.

Write today for illustrated brochure containing application and engineering information.

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WIRE & CABLE CO.

Cambridge, Mass. • Newington, N. H.

CIRCLE 119 ON READER SERVICE CARD

Custom Containers Solve Storage Problems

Oklahoma Gas & Electric Co cuts equipment storage and retrieval costs by custom-engineering palletized stack-type racks and containers to solve specific storage problems. Furthermore, by containing the equipment in the minimum space practical, safe and orderly store routines can be readily carried out. Four specific problems recently solved at OG&E are storage of: irregularly shaped hardware; V-braces; coiled wire; and, ground rod

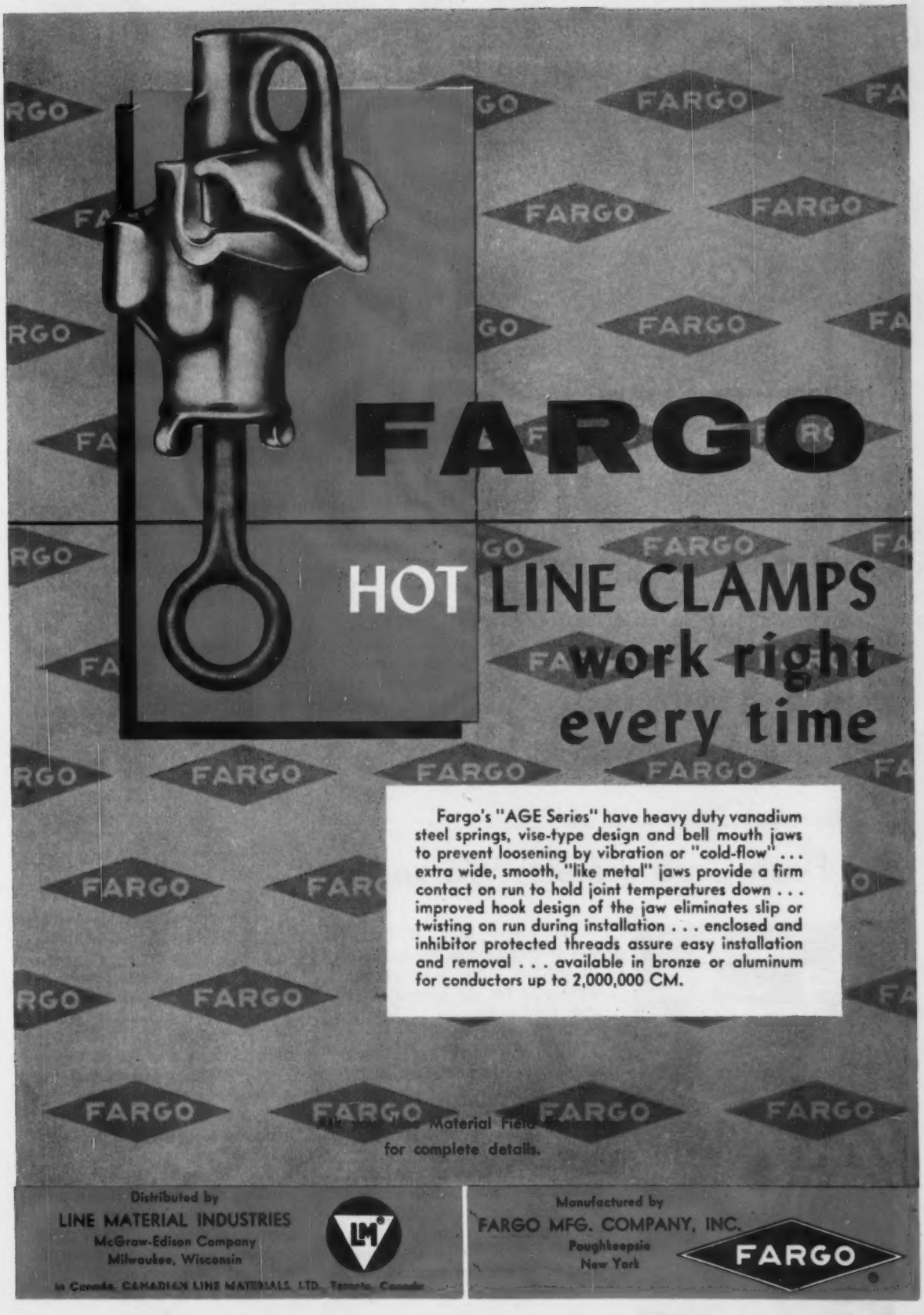
Coiled-Wire Put to "Bed": Coils of wire are easily stored in an orderly manner by using a "piggy-back" type of storage rack. The four-poster racks are stacked "bunk-bed" fashion, so that minimum storage is required.

The racks are made of pipe sections welded together. The rounded bottoms of the corner posts of one rack nest securely in the cup-shaped tops of the corner posts of the rack below it. Coils of wire are placed in a rack at ground level. An electric fork-lift is used to stack racks, as required.

By varying the dimensions of the "bunk-bed" racks, efficient storage and easy retrieval of ground rod, conduit sections, or other pipe-like equipment can readily be achieved. Rack sections can be added or removed depending on the quantity to be stored. Also, racks can be used for segregating pipe-like equipment of the same length, but of different diameters.

V-Braces at Home in Ladder-Rack: Special ladder-like palletized racks permit easy selection of the desired size of V-brace. Also, braces to be stored can be easily placed in the proper storage section. The rack arrangement resembles two step-ladders, positioned so that their "steps" slope upward away from each other. A V-brace is stored so that its ends are supported by the "same level" step of each ladder configuration. Braces are stored in the rack at different levels, depending on their sizes.

Hardware Caged in "Palletainer": Hardware with protruding ears, lugs, bolts or other irregularities are confined to a limited space in a particular size, wire palletized container. Thus, when the desired number of the awkward hardware have been loaded into the basket, they can be kept in as orderly an arrangement as practical. Furthermore, the "palletainers" are equipped with formed corner-legs to permit stacking with an electric fork-lift.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HOT LINE CLAMPS
work right
every time
Fargo's "AGE Series" have heavy duty vanadium steel springs, vise-type design and bell mouth jaws to prevent loosening by vibration or "cold-flow" . . . extra wide, smooth, "like metal" jaws provide a firm contact on run to hold joint temperatures down . . . improved hook design of the jaw eliminates slip or twisting on run during installation . . . enclosed and inhibitor protected threads assure easy installation and removal . . . available in bronze or aluminum for conductors up to 2,000,000 CM.
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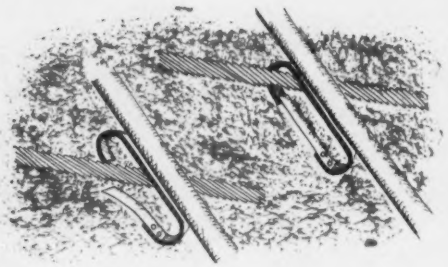


Clip Hanger Safely Holds Hot Stick

ANDREW C. BROWN, *System Supervisor—Distribution Methods, Virginia Electric & Power Co, Richmond, Va.*

A simple clip hanger provides a safe means for Virginia Electric & Power Co linemen working on the pole to secure hot sticks and similar tools when they are not being used. Because the hanger cannot be dislodged accidentally from the conductor, its use sharply reduces the hazard of falling sticks and tools.

The hanger has a "safety pin" design, consisting of a strip of ⅛-in. strap iron, ⅝ in. wide and about 9 in. long, bent into a C-shape. A ½-in. strip of spring steel is double-riveted to the inside bottom curve of the hanger so that its open side is closed, with the steel strip not quite touching the top of the hanger. The hanger can be made quickly and easily in a jig developed by Joseph H. Dove, a machinist in VEPCo's Alexandria office. In less than two weeks, more than 1,500 hangers were made using the special jig.

The hanger is attached on a wood or fiberglass stick with a stainless steel band with a screw tightener. When the stick or tool is hung on a conductor, the spring steel snaps closed. To remove the stick, the lineman lifts the stick until the spring is opposite the conductor and then exerts enough side pull to move the spring. In repeated tests it was impossible to dislodge the hanger accidentally from large or small conductors.

Anti-Flash Garb Protects Workers

The Safety Dept of Pacific Gas & Electric Co has designed an effective asbestos smock and hood gear for the protection of underground linemen working in manholes or vaults. The garb is standard on the PG&E system for work in confined quarters and for many other uses in substations and power plants.

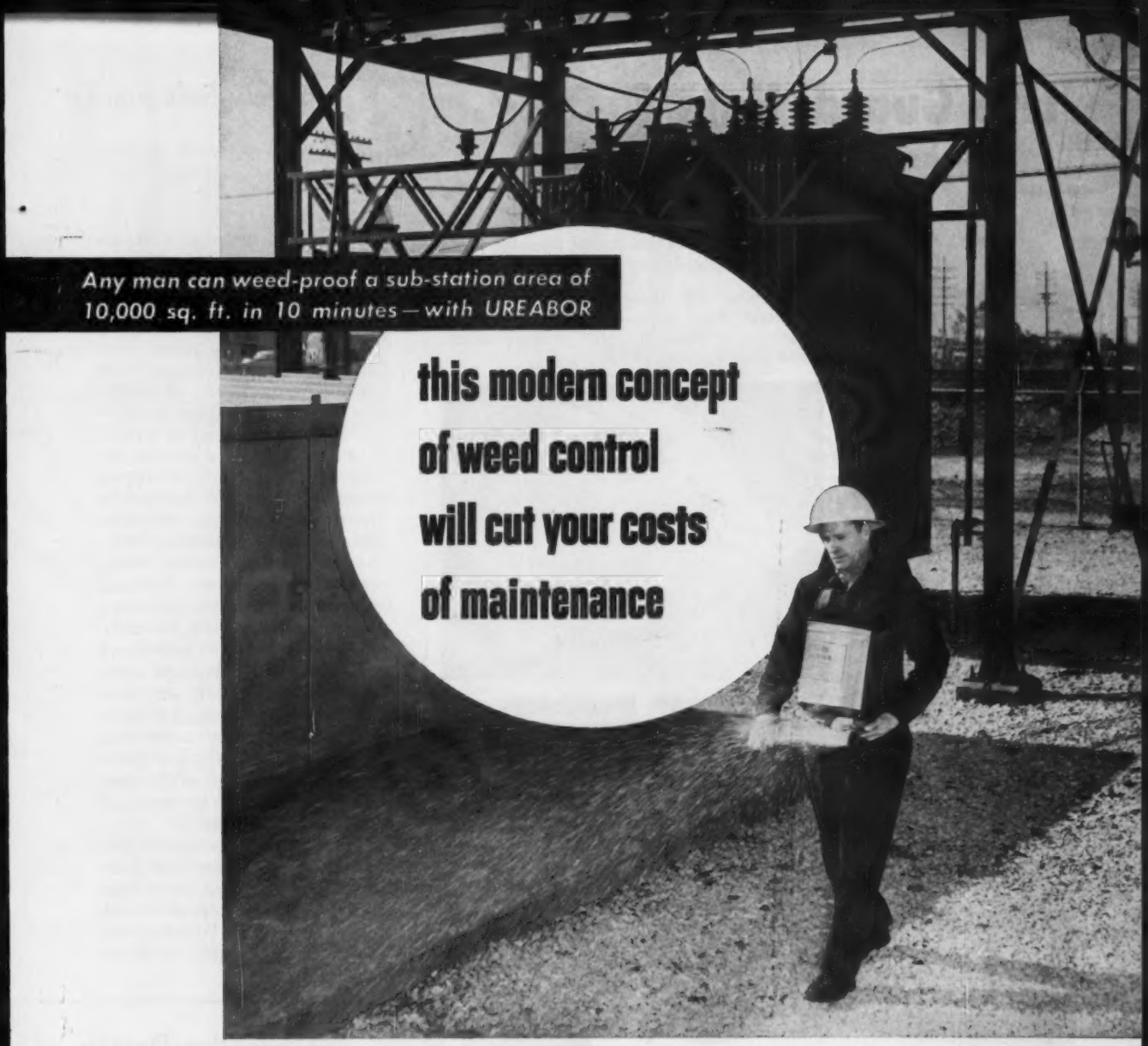
Since the asbestos suit was adopted a year and a half ago there has not been a single man burned or shocked while wearing this "flash suit" gear. It has, in one dramatic instance, saved the life of a man completely enveloped in an arc. In another case, a lineman neglecting to don his protective suit was electrocuted.

Charles Mason, a PG&E veteran, developed the idea of the suit and interested a manufacturer in its production. The asbestos suit comes complete with a Plexiglass windowed hood and a pair of double-layer gloves (leather and rubber). For testing the effectiveness of the protective garb PG&E constructed a thermometer-equipped dummy.

This model, dressed in smock, hood and gloves was subjected to a current in excess of that normally encountered in actual working conditions. The suit protected the model from injury. Currently, there are 300 of these $65 smocks distributed throughout the PG&E system.

(More Safety on page 124)

CIRCLE 122 ON READER SERVICE CARD



Any man can weed-proof a sub-station area of 10,000 sq. ft. in 10 minutes—with UREABOR

this modern concept of weed control will cut your costs of maintenance

—just apply UREABOR® *and you can forget about weeds for the season!*

Now you can chalk up big savings in weed control! UREABOR weed and grass killer makes this possible. Your own men can apply this dry granular material safely anytime during their regular rounds. One treatment does the job for the year; takes only a few minutes of their time. UREABOR weed killer is always ready to use direct from the convenient 50-lb. sack. There's nothing to mix . . . no water to haul . . . no need for costly spray equipment. And, because UREABOR is applied DRY, there is no spray-drift hazard to adjacent vegetation. Application rates are low. Only 1 to 2 lbs. per 100 sq. ft. The handy PCB Spreader does the job quickly and easily. *(See photo)* So, do as scores of other industries are doing . . . start saving time and money on *your* weed problems with UREABOR. It has been proved safe and effective during the past six years! Write today for literature.

UNITED STATES BORAX & CHEMICAL CORPORATION

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CIRCLE 123 ON READER SERVICE CARD

'Life Guard' Hats & Caps

The best in head protection for electrical/construction workers

Jackson's 'Life Guard' safety hats and caps safely resist over 20,000 volts, and they also provide impact resistance to more than satisfy federal requirements for safeguarding construction workers.

'Life Guard' safety caps have narrow brim around sides and back, visor in front. Injection molded plastic is strong yet flexible, has a soft comfortable feel. Caps may be ordered with attached welding helmets, goggles, and assorted face shields.

Standardize on this all-purpose safety hat for maximum head protection. Identify work categories by issuing these different hat colors: white, yellow, grey, and orange.

'Life Guard' safety hats offer neck protection with wide brim all around. The 'Life Guard' headgear is instantly adjustable in hat sizes, and its comfort keeps the hat where it does its job, on the worker's head. Chin straps and warm winterizers are available.

Sold by better welding supply and safety product dealers everywhere

Jackson Products

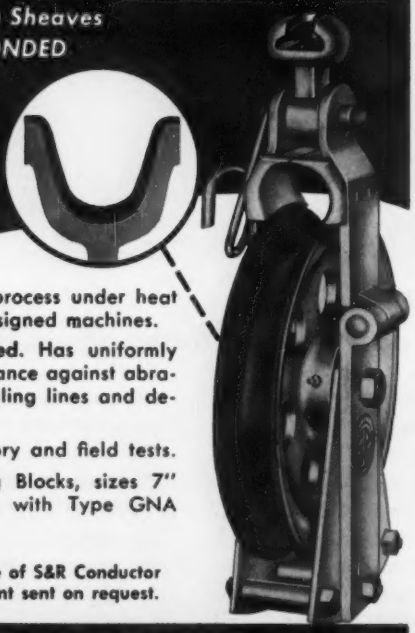
AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

31739 Mound Road, Warren, Michigan

CIRCLE 64 ON READER SERVICE CARD

Now, Conductor Stringing Sheaves WITH PERMANENTLY BONDED

TYPE GNA NEOPRENE LINING



Molded by a vulcanization process under heat and pressure on specially designed machines.

Lining is permanently bonded. Has uniformly excellent properties for resistance against abrasive wear from wire rope pulling lines and deterioration from lubricants.

Proven by extensive laboratory and field tests.

All S&R Conductor Stringing Blocks, sizes 7" through 28", are available with Type GNA Neoprene Lined Sheaves.

NEW CATALOG on complete line of S&R Conductor Stringing Equipment sent on request.

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SHERMAN & REILLY, INC.

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Screw Safeguards

***JAMES W. KING**, System Operating Dept, Indiana & Michigan Electric Co, South Bend, Ind.*

A special screw, used with caution and by authorized relay personnel only, provides a safe and simple method of securely attaching temporary wiring to terminals. Use of the screw eliminates most of the hazards encountered when modifying the wiring of current circuits without taking the protective equipment out of service.

Before opening a current circuit, a temporary circuit bypass connection must be installed to provide a continuous circuit to the operating equipment. Formerly, when temporary wiring changes were necessary, clip leads and other types of temporary connections were used. However, a clip lead can easily be bumped and knocked off, perhaps opening a current circuit and accidently tripping a relay. The many types of temporary connections formerly used were cumbersome and hazardous, particularly when several leads had to be connected to a single terminal.

The special connector now used is merely a standard shorting screw, modified by drilling and tapping the top of it with No. 8-32 threads. Another hole, perpendicular to this, is drilled

Magnaflux Detects

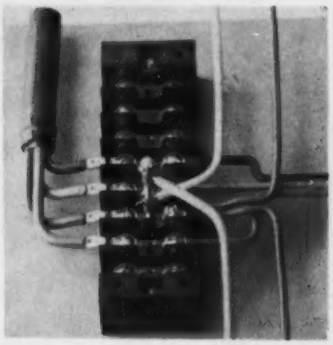
***B. J. HUNGATE**, Union Electric Co, St. Louis, Missouri*

Recent Magnaflux tests of lineman climbers at Union Electric Co quickly picked two climbers out of 200 which, if continued in use, could easily have led to serious accidents.

The key to the Magnaflux method of detecting dangerous climbers is that N & S magnetic poles are set up across a crack in the metal of the climber when it is exposed to a magnetic field.

The Magnaflux test kit consists of an ultraviolet hand spot light, Magnaflux paste, a hand

Temporary Wiring



to accept the wire. When the modified shorting screw is correctly installed in the terminal block and a standard No. 8-32 screw is added, a temporary wire can be firmly held in place and will not shake loose.

Several wires can be connected to the same terminal by using two or more of the modified shorting screws. These special screws can be machined from standard Relay Dept shorting screws for about $3 per dozen.

It must be emphasized that only authorized relay personnel should have access to the shorting screws and that a strict accountability check-off system be established for their use, else they may be left in a circuit after temporary wiring is removed.

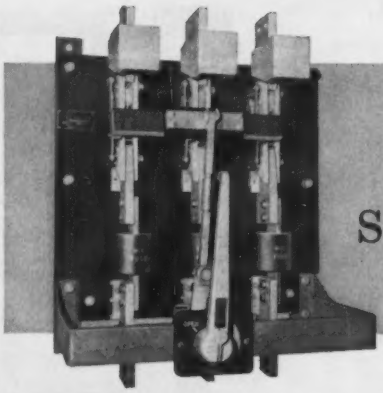
Dangerous Climbers

spray gun, and a permanent magnet. The thinned-out Magnaflux paste is sprayed over the surface of the climber to be tested. Iron filings in the paste penetrate the smallest cracks in the climber. The permanent magnet is then passed over the sprayed area.

When the area is subjected to ultraviolet or "black" light, the flux pattern readily indicates the existance of any cracks and thus the unsafe condition of the climber.

(More Safety on page 126)

CIRCLE 41 ON READER SERVICE CARD

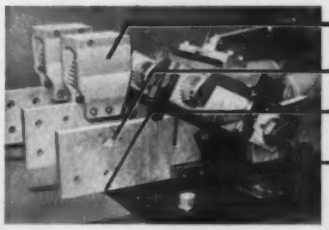


A New Load Break Service Entrance Switch

BOLT-LOC* by BARKELEW

FOR 1200 • 1600 • 2000 AMPERES • 240 • 480 • 600 VOLTS

Designed primarily for use with high interrupting capacity fuses for service entrance applications, and with or without fuses, as isolating switches, feeder disconnect or protector switches, for controlling electrochemical processes or any other use where cool operation, rugged construction, safety and complete reliability are required. Thoroughly tested for interrupting, short circuit and load carrying capacity.

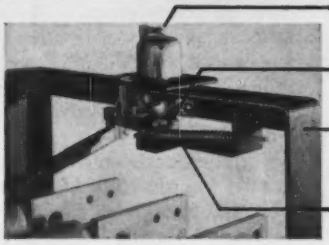


Molded arc suppressing material houses double slot multiple steel plate arc quenchers.

Vertical terminal contacts for easy bus and cable connections.

Using adapters, bus bars can be mounted parallel to base.

Positively locked forged nut for adjusting contact pressure, pre-set and locked at factory. Stainless steel spring holds initial contact pressure.



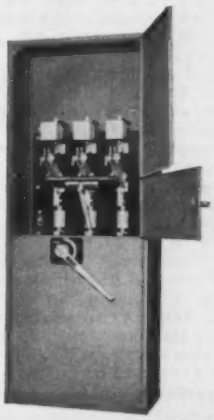
Handle contains latch for holding switch open or closed and slot for four padlocks.

Large bronze sleeve bearing supports operating shaft. Close tolerances throughout the switch mechanism give positive operation and long life.

Formed frame supports operating mechanism. No additional supports needed. Switch is adjusted before shipment, ready for mounting.

Quick break mechanism opens switch rapidly, drawing arc thru quenchers where it is quickly extinguished, usually in less than 1½ cycles.

Available standard enclosures 32″ wide by 14″ deep by 76½″ high. The fuse door and the upper switch access door are interlocked with the switch handle to prevent opening the doors with the switch closed or closing the switch with the doors open. The handle is arranged for using four padlocks in open and closed positions.



FOR COMPLETE DETAILS WRITE FOR
BULLETIN NO. 101

BARKELEW

*TRADE MARK

THE BARKELEW ELECTRIC MANUFACTURING CO.
MIDDLETOWN, OHIO
ELECTRICAL SWITCHING EQUIPMENT SINCE 1904

CIRCLE 125 ON READER SERVICE CARD

EVANS SAGWATCH MEASURES WIRE SAG

directly, accurately, swiftly without target boards, charts or tables

As described in Electrical World article (6/27/60, p. 56), instrument measures sag in feet and inches to within 1% of accuracy. Applicable to any wire, regardless of span, tension or type and size of conductor, this precision watch has a logarithmic dial that measures sag by timing the third return of a mechanical wave. Fully guaranteed.

For complete information write:

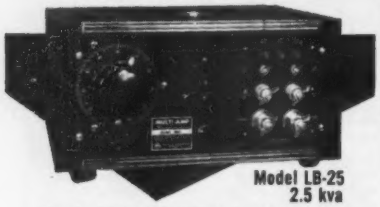
KIRK DIAL & CRYSTAL CO.
203 Seaboard Bldg., Seattle, Wash.

In Canada

WEBB DIAL & CRYSTAL CO.
576 Seymour St., Vancouver, B. C.

CIRCLE 65 ON READER SERVICE CARD

Reduce Set-up Time with MULTI-AMP Portable Load Boxes . . .



Model LB-25
2.5 kva

Each MULTI-AMP load box is a portable low-voltage, high-current transformer load or adjustable power supply. Units supply any current from zero to rated amperes in stepless increments by fingertip control . . . Output ratings of various models range from 12.5 to 5,000 amperes.

Basic components of each unit consist of an output transformer with variable cross-section multi-tap secondary to provide taps at various current and voltage ratings; a variable autotransformer to supply the primary of the output transformer provides short-circuit and overload protection. Available with or without metering.

WRITE TODAY for valuable 8-page catalog that completely describes these and other advanced MULTI-AMP units . . . they're built to help you take the guesswork out of electrical protection!

MULTI-AMP
Division
MULTI-AMP ELECTRONIC CORPORATION
Dept. EWC 485 Lehigh Avenue / Union, N. J.

Hatch Barricade and Cover Cut Hazards

J. W. MURRAY JR, Distribution Engineer, Southwestern Electric Power Co, Shreveport, Louisiana

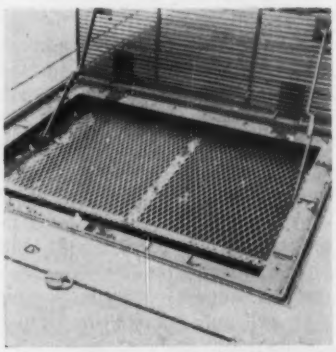
A lightweight sidewalk barricade now guards Southwestern Electric Power Co vault hatches while maintenance or repair is going on below ground. Furthermore, when this safety-chained barricade is supplemented with a sliding-grate hatch cover, a virtually accident-proof environment is established.

The barricade and grate assembly was developed to eliminate the hazardous practice of workmen rigging spur-of-the-moment, iron pipe railings around vault job-sites. Oftentimes, the temporary barricade was bumped out of place by pedestrians and accidents resulted. Even if the barricade stayed in place, it was possible for a person to stumble, or a child to climb over, the barricade and fall into the vault pit. Surrounding the vault opening with an efficiently-fixed barricade, and covering the vault hatch with a fool-proof cover, have eliminated two sources of accidents.

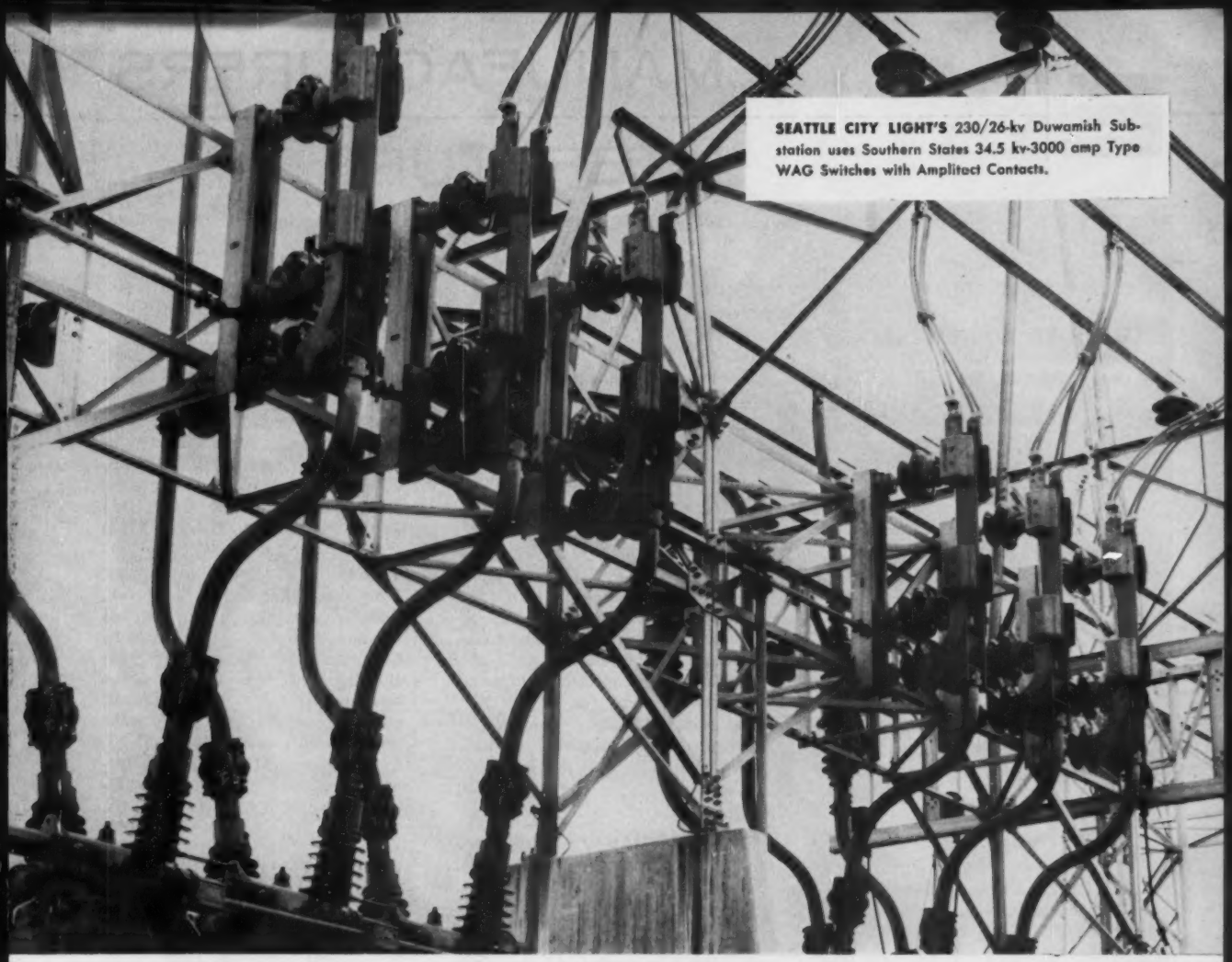
The new tubular aluminum barricade is of collapsible design and can be carried and set up around a job-site hatch by one workman. Assembled, it fits snugly into the vault opening and latches onto the hatch with two drop-over hooks plus safety chains to prevent its being bumped or pushed out of place.

The sliding-grate hatch cover is made of angle iron, welded at the corners. Heavy expanded or meshed metal is tack welded to the frame, over its perimeter. Two pieces of channel iron are bolted to the under side of the vault hatch to serve as runners for the safety grate. The entire assembly is hot-dip galvanized after fabrication. Cost is about $30.

The grate is only slid across the hatch when there is no workman guarding the open vault hatch. The last man entering the vault can easily slide the grate closed.



MESH GRATE provides protection in addition to barricade at vault opening. The last man going into the vault slides the grate into place



SEATTLE CITY LIGHT'S 230/26-kv Duwamish Substation uses Southern States 34.5 kv-3000 amp Type WAG Switches with Amplitact Contacts.

The Man-sized Switch for Man-sized Jobs

FIG. 1

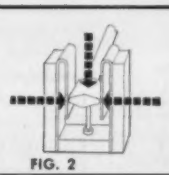


FIG. 2

AMPLITACT® CONTACTS ON WAG

High pressure Amplitact contacts provide maximum dependability under high current short-circuit conditions. The arrows in Fig. 1 show direction and relative magnitude of electromagnetic forces induced when switch is subjected to fault current.

The resultant electromagnetic forces, as shown in Fig. 2, greatly increase contact pressure and positively hold blade in the engaged position. For complete details, write for Bulletin 56AM on the Amplitact.

"Don't send a boy to do a man's job" is a saying especially applicable when choosing switchgear that must safely carry 3000-4000 amperes. Not only must it be capable of carrying such loads after years of service, but it may be called on to withstand fault currents up to 120,000 amperes without damage.

It's a man-sized job. Dirt, industrial waste, years of exposure to every type of contamination make the job even tougher. It takes a man-sized switch!

The Type WAG illustrated above is a good example. It's big and tough enough to carry its rated load continuously without excessive temperature rise. A built in safety factor more than compensates for the deteriorating effects of long, hard service. Amplitact® contacts provide high pressure for handling the heaviest faults.

The WAG is finding wider and wider acceptance in all ratings. It's now in service in virtually every state in the union.

Get complete details from your Southern States representatives or write direct for our latest bulletin.

LIVE BETTER ELECTRICALLY

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

CIRCLE 127 ON READER SERVICE CARD

MANUFACTURERS LITERATURE

To request literature, use code numbers **indicated for each item when filling in** Reader Service Card

COMMUNICATION

CARRIER EQUIPMENT . . . new transistorized Multiplex-Carrier equipment transmits from 1 to 600 full duplex toll quality voice channels over single radio beam. Bulletin ECM-122, four pages. General Electric Co, Communication Products Dept, Box 4197, Lynchburg, Va. **(151)**

LINE TRAPS . . . aluminum, used to assure normal operation of power-line carrier-current channels under a variety of adverse conditions which otherwise might disrupt service. Illustrated with equipment and installation photographs, charts and sketches. Bulletin ECC-113, eight pages. General Electric Co, Communication Products Dept, Box 4197, Lynchburg, Va. **(152)**

CONSTRUCTION

OUTRIGGERS . . . Lorain MC-760 Moto Crane, designed for high-capacity crane and clamshell applications. The 60-ton outriggers set up in about one min, are designed with special curved beams with attached, self-adjusted floats that move out and down simultaneously. Booklet, 12 pages. Thew Shovel Co, Adv Dept, Lorain, Ohio. **(153)**

TRENCHER . . . Compact for city and suburban work, digs trench 10 to 20 in. wide, down to 5 ft deep, within 17 in. of poles. Model 92 illustrated in action. Dimensions and specifications. Bulletin L-108, eight pages. Cleveland Trencher Co, 20100 St. Clair Ave, Cleveland 17, Ohio. **(154)**

DISTRIBUTION

ENCLOSED SAFETY SWITCHES . . . also service entrance equipment, branch-circuit panels, and meter sockets listed and illustrated. Charts and tables of wiring data. Catalog 6002, 48 pages. General Switch Co, 45 Roebling St, Brooklyn, N. Y. **(155)**

CIRCUIT RECLOSER . . . automatic, Type MB-2, for use with 2.4 to 14.4-kv service in 70, 100, 140, 200, and 280 amp. Described as having fastest clearing time of any recloser of Power II class: one-cycle interruption with ½-cycle clearing. One feature detailed is safety lockout lever attachment (optional). Bulletin 1550C 12 pages. I-T-E Circuit Breaker Co, Greensburg, Pa. **(156)**

SHUNT CAPACITORS . . . NEMA rating standards, manufacturing standards, testing standards for enclosed and non-enclosed indoor and outdoor units. Guide for application and operation. Graphs on internal arcing for 25 and 50-kvar units. Standards Pub No. CP 1-1960, 50¢. National Electrical Mfrs Assn, 155 East 44 St, NYC 17. **(157)**

TREEGUARDS . . . plastic, for protection of overhead lines from tree-limb abrasion. Of rigidly-controlled co-polymer of styrene and rubber, for protection from −30 to 180F temperatures, applied by hand wrapping or with conventional hot line tools. For 383 covered conductor and 50 solid, stranded and ACSR conductor uses. Catalog Section TG, four pages. Fanner Mfg Co, Electrical Products Div, Brookside Park, Cleveland 9, Ohio. **(158)**

ANCHOR RODS . . . ½ to one in., made with molten-welding process to resist rust and corrosion, used with Type M guy strand. Ordering data, typical anchor applications illustrated. Booklet, eight pages. Copperweld Steel Co, Wire & Cable Div, Glassport, Pa. **(159)**

ARC INHIBITOR . . . for 115 and 230-dc inductive circuits. Increases contact life on master switches, push buttons and similar pilot devices; prevents voltage break-down of control wiring; and reduces contactor drop-out time. Bulletin 9600, two pages. Square D Co, EC&M Div, 4500 Lee Rd, Cleveland 28, Ohio. **(160)**

INSTRUMENTS

PORTABLE TEST UNITS . . . for circuit breakers, 1, 2.5, 5, 7.5, 15, and 22.5 kva. All models illustrated, testing considerations specifications given in detail. Selector chart of test unit models for various sized circuit breakers. Bulletin SB-CB-1, 16 pages. Multi-Amp Div, Multi-Amp Electronic Corp, 465 Lehigh Ave, Union, N. J. **(161)**

RECORDER . . . Multipoint, Universal Model 15 Electronik. Can be converted within seconds to measure from 2 to 24 points. Compensation changed by substituting new terminal board for one provided with instrument; range converted by use of new range resistor card. Spec 153-23, four pages. Minneapolis-Honeywell Regulator Co, Wayne & Windrim Aves, Philadelphia 44, Pa. **(162)**

INSTRUMENTS . . . cable fault-locating equipment, dielectric test sets, and other testing instruments fully covered in digest of company's line. Bulletin 19-60-9, 12 pages. James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa. **(163)**

THERMOCOUPLE COMPONENTS . . . specifications and ordering data on replaceable components for company's thermocouple assemblies, including bare elements, elements with insulators, insulators, metal and ceramic protecting tubes, heads, blocks, connectors, and miscellaneous fittings. Catalog C 100-3, 32 pages. Minneapolis-Honeywell Regulator Co, Wayne & Windrim Aves, Philadelphia 44, Pa. **(164)**

INSULATION

ELECTRICAL TAPE . . . 24 tape uses described, from protecting electrician's tools to use of color-coded tapes to speed mass assembly of electrical products. "Useful Tape Tips," 12-page booklet. Johns-Manville, Dutch Brand Div, 7800 South Woodlawn Ave, Chicago 19, Ill. **(165)**

(More Literature on page 130)

Install pad and cable compartment now . . .

add transformer later when service is required

POLE STAR® Lawn-master transformers

make it easier to go underground

Pennsylvania's new Lawn-master Pole Star Transformers permit utilities to eliminate poles and overhead wires without incurring the expense of underground vault installations. Surface-mounted units for use with underground distribution systems, Lawn-master transformers are *compartmented*—for utmost convenience during installation, and for utmost flexibility when load begins to grow.

Cable compartments alone can be installed on the pad at any time during the housing or building construction. (Some utilities arrange for contractors to handle this portion of the job.) The transformer can be added later, when service is needed.

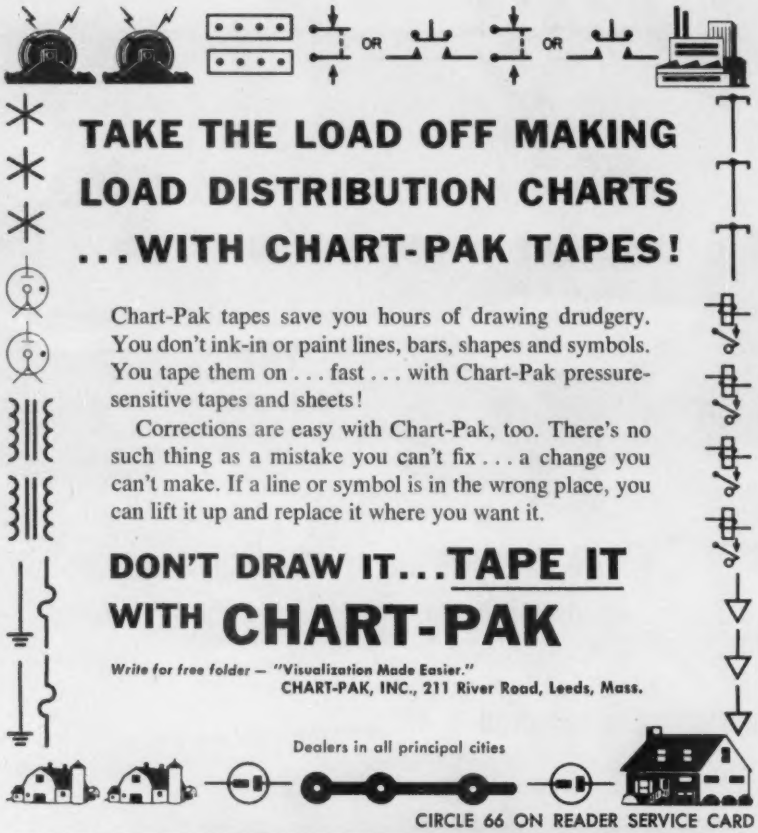
As for long-range flexibility—each compartment is designed for use with three different transformer kva ratings, in all voltages.

Easy to camouflage with shrubbery, small trees

Lawn-master Transformers are compact and unobtrusive, and can be easily camouflaged to blend with the surrounding landscaping—permitting full benefit from the view-enhancing characteristics of underground distribution. Single-phase units all measure less than three-and-a-half feet in height. The largest available three-phase unit (500 kva) is only six feet tall, or little more than the average man.

BULLETIN D-360 gives design and construction details, weights and dimensions. For a copy, write to Distribution Sales, Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pennsylvania.

PENNSYLVANIA DISTRIBUTION TRANSFORMERS


TAKE THE LOAD OFF MAKING
LOAD DISTRIBUTION CHARTS
...WITH CHART-PAK TAPES!
Chart-Pak tapes save you hours of drawing drudgery. You don't ink-in or paint lines, bars, shapes and symbols. You tape them on . . . fast . . . with Chart-Pak pressure-sensitive tapes and sheets!
Corrections are easy with Chart-Pak, too. There's no such thing as a mistake you can't fix . . . a change you can't make. If a line or symbol is in the wrong place, you can lift it up and replace it where you want it.
DON'T DRAW IT...TAPE IT
WITH CHART-PAK
Write for free folder — "Visualization Made Easier."
CHART-PAK, INC., 211 River Road, Leeds, Mass.
Dealers in all principal cities
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CIRCLE 66 ON READER SERVICE CARD

It took 29 yrs. research to make
JAQUES hydraulic
HOLE DIGGERS
Fastest, Strongest, Safest
most economical!
Jaques TJ-254 digging at 30-degree angle
Operates at up to 45 degrees
Time-and-money-saving features of Jaques All-Hydraulic Hole Diggers took 29 years to develop. Rugged, versatile Jaques TJ-254 mounts on standard trucks, drills holes up to 48" diameter, to 25' depth, in hardest soil or rock — FASTER, CHEAPER, EASIER than competitive machines! Fewer moving parts insures minimum down-time, maintenance, operating costs. Shock-resistant device relieves strain in rock digging. Simple to operate with only 3 primary adjustments. FREE DEMONSTRATION WILL PROVE THESE CLAIMS!!
-----FREE----
TEXOMA ENTERPRISES, INC.
HIGHWAY 75 North, SHERMAN, TEXAS
☐ Send me FREE detailed literature.
☐ Have representative call. No Obligation.
NAME
TITLE
ADDRESS
CITY
STATE
TEXOMA ENTERPRISES, INC.
HIGHWAY 75 NORTH • SHERMAN, TEXAS

More Literature

(Continued from page 128)

INSULATION . . . lists all types of insulations and insulating cements available. Also describes Careytemp, new industrial insulation offering heat resistance in wide range up to 1,600 F. This offers resistance to moisture, acid and corrosion with practically no linear shrinkage. Tabular product selection guide. Form 6451, four pages. Philip Carey Mfg Co, 320 S Wayne Ave, Cincinnati 15, Ohio **(166)**

SILICONE RUBBERS . . . RTV line of room temperature vulcanizing silicone rubber compounds, including many new ones. Describes RTV-11, newest and lowest viscosity liquid compound of this type. Gives information on thermal conductivity compression set of RTV's, contains expanded section on new data on heat-aging and electrical properties. Technical Data Book S-3, 12 pages. General Electric Co, Silicone Products Dept, Waterford, N. Y. **(167)**

POWER PLANTS

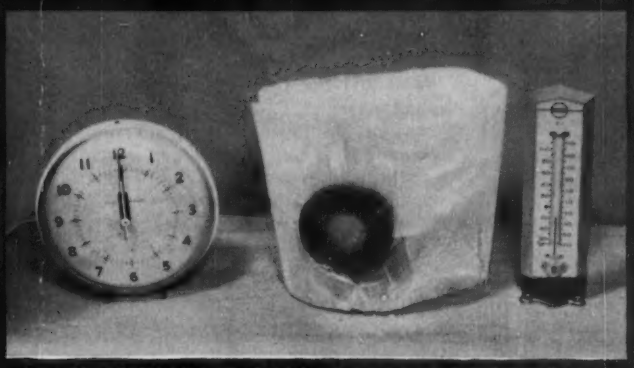
PEAKING TURBINES . . . combustion gas, 7,000 to 28,000 kw. Outlines savings possible through their use: lower installed costs, minimum space and personnel requirements, less transmission equipment investment, lower line losses and lower standby. Bulletin GED-3761, General Electric Co, Schenectady 5, N. Y. **(168)**

CONDUIT FITTINGS . . . condulets: special alloys, platings, and coatings to eliminate or retard harmful effects of acids, alkalies, salts, gases and other corrosive influences. Listing of application of materials, showing general performance with chemicals. Bulletin 2699, 18 pages. Crouse-Hinds Co, Syracuse 1, N. Y. **(169)**

BOILER MAINTENANCE . . . check sheet chart lists all pertinent information with regard to boiler. Serves as handy record for all boiler maintenance performed. Chart, one page. Commercial Boiler Control Co, 11 Bleecker St, Albany, N. Y. **(170)**

(More Literature on page 132)

WHEN IT'S COLD - THE SPLICE WILL HOLD WITH SLIPKNOT CW VINYL ELECTRICAL TAPE!



A roll of Slipknot CW is frozen solid in a block of ice at 14° F below zero.

Tape is broken out of ice . . . still at 14 below . . .

and in this frigid atmosphere remains completely flexible — strips perfectly from roll — even with ice still imbedded in the core.

At 14° F below zero, this remarkable vinyl tape

- **Strips easily from the roll . . .**
- **Remains completely flexible . . .**
- **Sticks down instantly — molds perfectly — holds permanently!**

Try it in your home freezer — write for a sample roll on your letterhead today!

35 seconds later perfectly conforming splice is made. Temperature . . . still 14° below!

TAPES BY
SOLD ONLY THRU RECOGNIZED DISTRIBUTORS
PITTSBURGH RUBBER COMPANY, INC.

a winch so unusual

we don't know how many uses it has!

here's how it looks inside

here's how it looks on a truck

BRADEN CL WINCH

This BRADEN CL Winch was designed primarily for utilities. It will draw wire or cable at a CONSTANT SPEED until the winch drum is completely filled! *This has not been possible before.*

We believe there are many uses for the new CL Winch. Maybe it will help solve a winching problem for you where CONSTANT SPEED is desirable. Write for complete information on this unusual CL Winch, or let us know if you would like for a representative to call on you. We believe we've really got something.

BRADEN WINCH DIVISION OF MOTOR PRODUCTS CORPORATION

P. O. BOX 547 • BROKEN ARROW, OKLAHOMA

Braden Winches

"In Service Around the World"

More Literature

(Continued from page 130)

STEEL TUBING . . . selection of steel tubing according to type, finish, analysis, formability, machinability, weldability and relative cost made easier through comparative listing of characteristics. Tips on when to use tubing instead of bar stock. Technical bulletin 12-10, four pages. Joseph T. Ryerson & Son, Inc, Box 8000-A, Chicago 80, Ill. **(171)**

HAND-TYPE CLEANER . . . with two-speed motor, delivers power blast of clean air to remove dust and lint from largest motors and machines. Reaches spots which cannot be touched by hand or compressed air. Also sprays insecticides, paint, etc. 1 1/3 hp. Three other models for heavy-duty, general-duty, and light-duty use. Bulletin, four pages. Ace-Sycamore, Inc, 405 DeKalb Ave, Sycamore, Ill. **(172)**

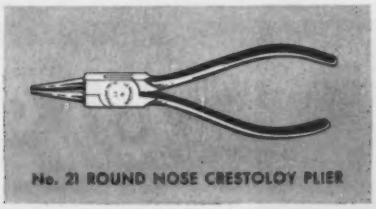
STORES & SHOPS

LIGHTING LAYOUTS . . . for designing floodlighting installation for loading and unloading platforms. General application guide rules, list of materials. Bulletin OLP-1012, one page. Also, lighting layout for typical storage and materials-handling area. Mounting heights, type lamps. Sample problem and solution. Bulletin OLP-1010, one page. General Electric Co, Schenectady 5, N. Y. **(173)**

INDUSTRIAL TRUCKS . . . electric-driven, from first center-control fork-lift truck to new Crab design, for materials handling within plant. Many models illustrated. Brochure, 12 pages. Automatic Transportation Co, 149 W 87 St, Chicago, Ill. **(174)**

MARKERS AND SIGNS . . . electrical markers, pipe markers, accident prevention signs. Printed on waterproof vinyl cloth. Nonconductive electrical markers listed in three styles, black letters on orange background. Speedy Marx, furnished on quick-release dispensing cards, backed with instant-stick adhesive. Catalog, 24 pages. North Shore Nameplate, 214-27 Northern Blvd, Bayside 61, N. Y. **(175)**

(More Literature on page 134)

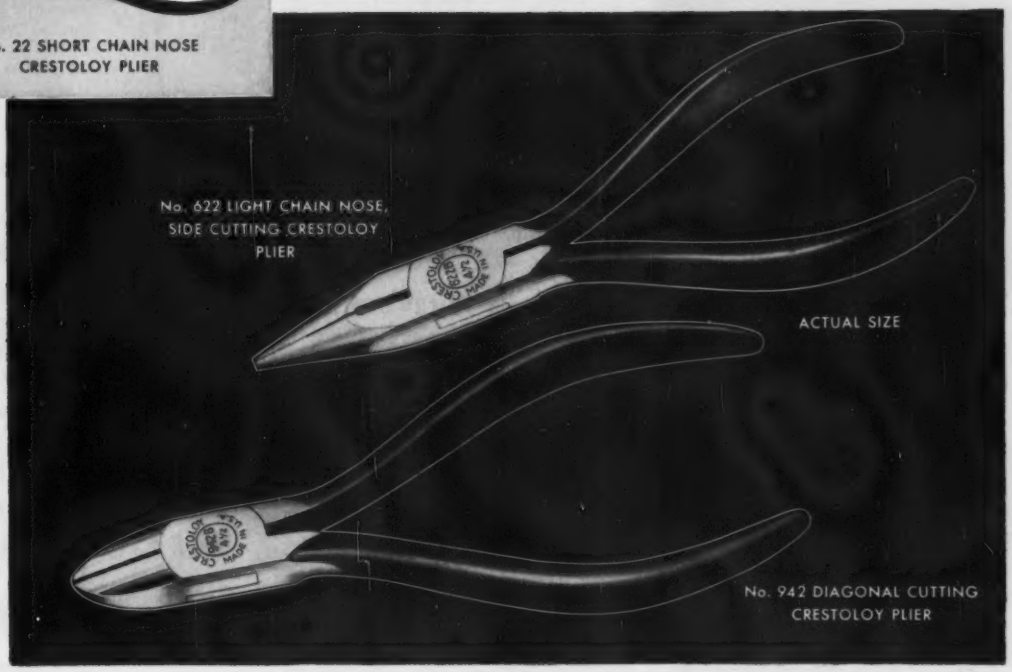


No. 21 ROUND NOSE CRESTOLOY PLIER

CRESTOLOY MINIATURE PLIERS

with precision-fitted BOX JOINTS*

No. 22 SHORT CHAIN NOSE CRESTOLOY PLIER



Forged from CRESTOLOY Steel, these fine pliers have precision-fitted box joints that assure perfect jaw alignment and smooth operation under long, hard usage. Excellent balance, combined with broader handles reduces worker fatigue. All are electronically hardened. Cutting pliers have tested edges. Finished with polished heads and gun metal handles.

Sold by hardware dealers and industrial distributors everywhere.

*Crescent has pioneered the development of Box Joint Pliers in the United States.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

CIRCLE 133 ON READER SERVICE CARD 133

for Long Life-

GRAYBAR QUALITY TAPE

...Preferred and used because it meets TOUGHEST SPECS

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HOISTS AND TROLLEYS . . . motor-operated, Frame 1, 1½, 2 and 3; electric chain hoists, hand-operated hoists, Pull-A-Way units, jib cranes, hand-traveling cranes, and motor-driven cranes. Data on general features of all units and components. Bulletin DH-28A, eight pages. American Chain & Cable Co, Inc, 929 Connecticut Ave, Bridgeport 2, Conn. **(176)**

NARROW-AISLE TRUCK . . . Model MN AisleMaster, with hydraulic powered caster enabling side travel, designed for transporting long, heavy loads in aisles as narrow as 7 ft. Operating controls located at driver's compartment. Right front base arm with hydraulic-powered caster that turns 180 deg. MS-193, one page. Lewis-Shepard Products, Inc, Dept R10-36, 125 Walnut St, Watertown 72, Mass. **(177)**

STORAGE EQUIPMENT . . . steel, includes angle shelving, T-line shelving, steel lockers, cabinets, wire basket storage units and service truck shelving. Tables list dimensions. Illustrated. Bulletin DC-60, eight pages. Penco Div, Alan Wood Steel Co, 200 Brower Ave, Oaks, Pa. **(178)**

STREET LIGHTING

STREET LIGHTING . . . foot-candle guides for company's preferred lighting line of filament, mercury, and fluorescent units. Product data on lighting units, controls, ballasts, poles and brackets. Examples of typical street, highway, shopping center, and parking area lighting applications illustrated. Bulletin GEA-7100, 28 pages. General Electric Co, Schenectady 5, N. Y. **(179)**

SUBSTATIONS

ELECTRICAL OPERATORS . . . applied for remote control of Types E, EH, F, and HF circuit breakers. Dimensions, schematic of installation. Booklet B-7534, four pages. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa. **(180)**

(More Literature on page 136)

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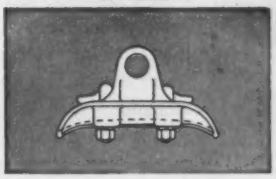

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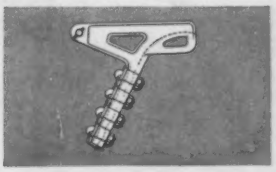

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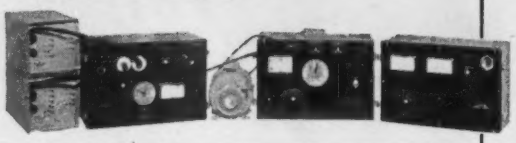

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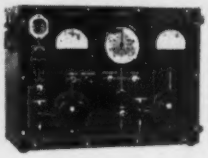

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POWER FUSES . . . for 34.5 to 138-kv power transformer primaries, station service auxiliary transformers, potential transformers and sectionalizing. Fuse application principles, short-circuit interrupting ratings, and other data discussed. Vertical, upright and inverted styles illustrated. Bulletin 261, 24 pages. S&C Electric Co, 4435 N Ravenswood Ave, Chicago 40, Ill. **(181)**

SWITCHGEAR . . . Fusematic, concept in switchgear protection described for controlling modern electrical feeder systems in 600-v class when high interrupting capacities are needed. Fusematic is coordinated combination of a power circuit breaker and current-limiting fuses. Outlines five specific applications, parts and pertinent technical data. Time-current characteristics graph. Bulletin 6020, eight pages. Federal Pacific Electric Co, General Offices, 50 Paris St, Newark 1, N. J. **(182)**

METAL-CLAD SWITCHGEAR . . . redesigned line of 4160-v units, both indoor and outdoor and outdoor, minimum depth and walk-in types, in ratings through 3,000-amp continuous current, 250-Mva interrupting. Descriptions of compactness, stored energy closing, new closed door horizontal drawout mechanism and other features. Ratings and dimensions, construction and performance features. Fully illustrated. Bulletin 2801-2A, 20 pages. I-T-E Circuit Breaker Co, 1900 Hamilton St, Philadelphia, Pa. **(183)**

LIGHTNING ARRESTERS . . . intermediate-class, Type F, from 20 through 121 kv. Design and operating features, ordering and dimensional information. Mounting brackets described. Bulletin LA4, 12 pages. Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis. **(184)**

TRANSFORMERS

POWER TRANSFORMERS . . . contour design, shell-form, in-

(Continued on page 140)

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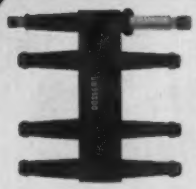
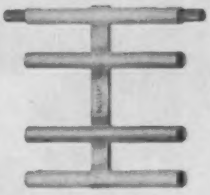


Insulated Crab Connector type CBR



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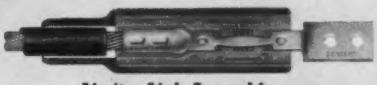
MICON Stud Connector type MCBS



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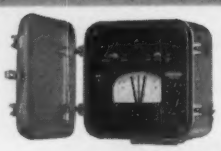

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(Continued from page 136)

cludes, in general, all transformers above 161 kv, as well as 161-kv units rated 50 Mva and above. Internal and external construction details are illustrated by photographs and drawings. Bulletin No. P-560, 40 pages. Pennsylvania Transformer Div, McGraw-Edison Co, Box 330, Canonsburg, Pa. **(185)**

DISTRIBUTION TRANSFORMERS . . . oil and Pyranol-filled, 112½ to 2,500 kva, and stacker-type units from 112½ to 225 kva. Outlines construction details, standard tests and accessories, and switches. Tables and diagrams give electrical and mechanical characteristics. Bulletin GEA-6832A, eight pages. General Electric Co, Schenectady 5, N. Y. **(186)**

TRANSFORMERS . . . dry-type, 600 v, 3 through 50 kva, single-phase, "whisper-quiet," small, light. For on-the-site load-center applications where critical voltage must be maintained. Curvacore construction of the 80 C rise type described. Bulletin 61B8222B, four pages. Allis-Chalmers Mfg, Milwaukee 1, Wis. **(187)**

ALUMINUM WELDING . . . brazing and soldering survey. Twelve charts on composition of aluminum alloys, technical and physical properties, recommended filler alloys for welding. Pocket-sized manual, 40 pages. All-State Welding Alloys Co, Inc, White Plains, N. Y. **(188)**

WIRE & CABLE . . . Teflon-insulated hook-up wire for internal wiring of meters, panels, electrical and electronic equipment. Also data on Teflon cable for high-frequency equipment and radio-frequency transmission lines. Tables for selection from variety of components and configurations, all in Class H Teflon jacketing, 90 to 260 C. Brochure DM-S-6001, four pages. Sequoia Wire & Cable Co, 2201 Bay Rd, Redwood City, Calif. **(189)**

(More Literature on page 141)

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SUSPENSION HARDWARE . . . and testing of Armour-Grip suspension hardware. Includes analysis of fatigue problem, unbalanced loading. Sections on electrical characteristics, mechanical specifications, field testing. Technical booklet, 20 pages. Preformed Line Products Co, Dept AGS, 5349 St. Clair Ave, Cleveland 3, Ohio. **(190)**

RIGID CONDUIT . . . aluminum, with comparisons to steel conduit: in chart, table, and text form. Recommended on-the-job techniques described, National Electrical Code information, safety considerations and instructions. Manual, 32 pages. Kaiser Aluminum & Chemical Sales, Inc, Dept NR-45, 300 Lakeside Dr, Oakland 12, Calif. **(191)**

CABLES . . . for 600-v service, Anhydroprene XX, for power circuits in ducts or conduit, or as open wiring in buildings. Dimensions, test data, design specifications, and tables of selections. Brochure No. 1037, four pages, Simplex Wire & Cable Co, Cambridge, Mass. **(192)**

JOINT COMPOUND . . . for use in making joints in aluminum bus conductors, Alcoa No. 2 EJC electrical compound. Developed from research aimed at minimizing resistance of bolted joints in aluminum. Supporting charts and graphs, analyses of service experience and laboratory evaluation. Report, Alcoa No. 2 EJC, six pages. Aluminum Co of America, 735 Alcoa Bldg, Pittsburgh 19, Pa. **(193)**

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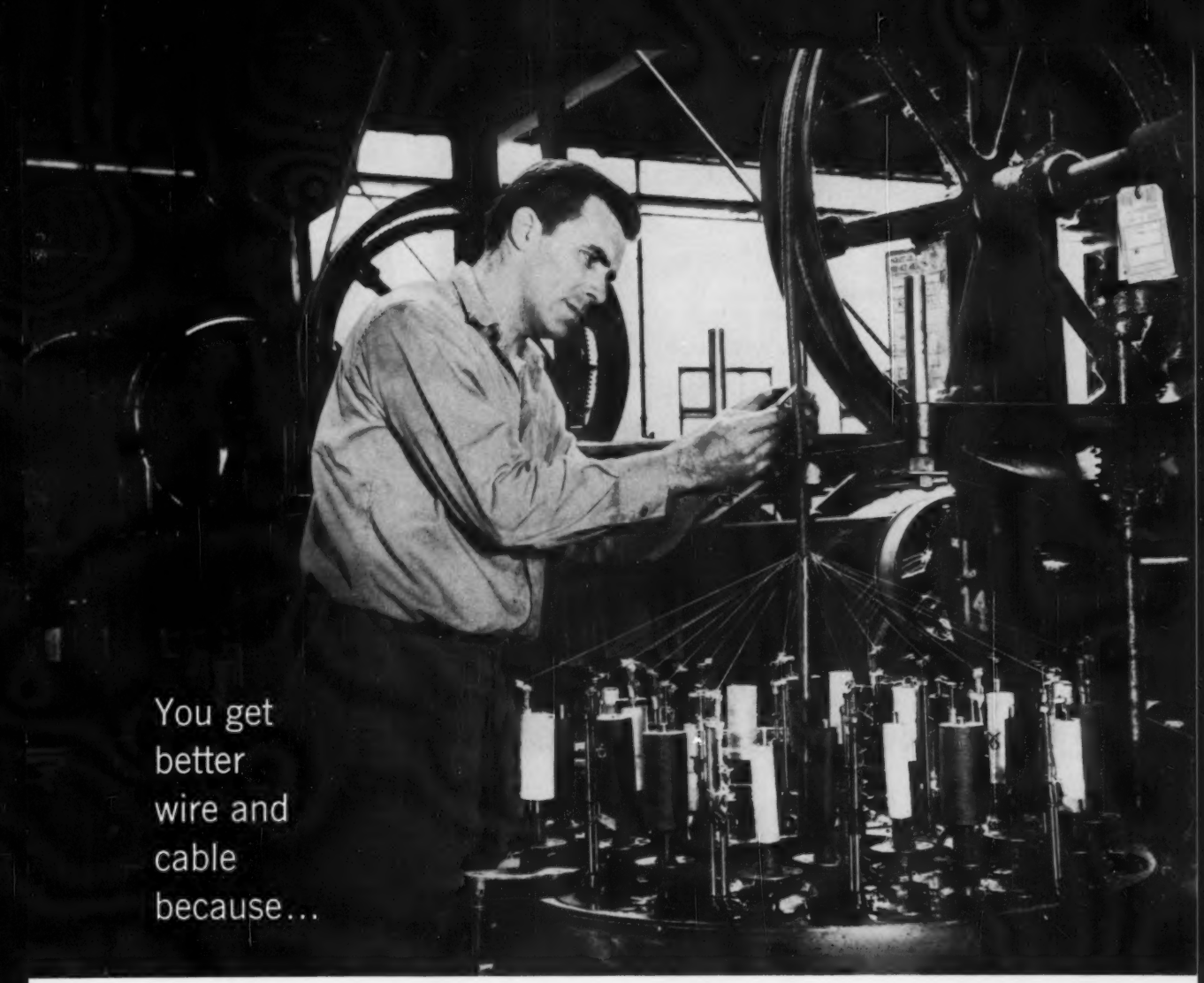


NEARLY EVERYONE AT CIRCLE'S AN "INSPECTOR"

Take Oscar Stangoni, braiding machine operator at Circle.

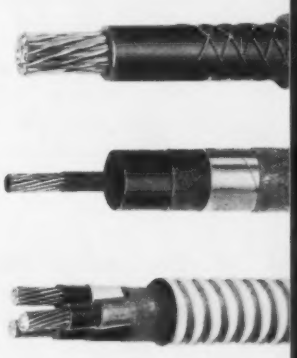
Mr. Stangoni doesn't need to use a micrometer. Ordinarily, his foreman sets up the machine, checks with a "mike" at the beginning of a run and several times during a run to make sure that the O.D. is OK.

But Oscar Stangoni uses one just the same—and he uses it often. Why? Maybe pride or a sense of responsibility—or maybe just because he feels better when he also knows the cable is absolutely right.

This is just one of many ways in which Oscar Stangoni and hundreds more like him at Circle make sure that the wire and cable they turn out is as good as it can possibly be.

And that's another reason, we believe, why Circle products have achieved their reputation for quality.

Next time you specify cable, we suggest you ask for Circle. There's no finer cable made. CIRCLE WIRE & CABLE CORP., Maspeth, N. Y.



CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

RUBBER COVERED WIRE & CABLE • VARNISHED CAMBRIC CABLE • PLASTIC INSULATED CABLE • NEOPRENE SHEATHED CABLE • CIRTUBE* EMT

CIRCLE 145 ON READER SERVICE CARD

record power station operations just milliseconds apart

In the few hectic seconds in which a flurry occurs, the station operator must quickly evaluate the situation and take all necessary corrective actions. Fischer & Porter's MOR—Millisecond Operation Recorder—helps him concentrate his efforts on that job by relieving him of the necessity of later reporting each event and action in correct sequence. And it performs this function for less than one-third the cost of previous systems.

MOR establishes for once and for all the exact time and sequence of every change in trouble contact position. Even events occurring milliseconds apart are accurately recorded on the easily read and analyzed tape. As a result, MOR has also proved ideal for checking prerun operation of drop-out relays and other protective devices, as well as automatically monitoring substations.

Designed specifically for power station requirements, MOR supports its flexibility with dependable, trouble-proof circuitry that defies time, yet needs little or no maintenance. MOR can actually take care of itself, demanding only that the recording tape be changed every two months, and the printing carbon once each year. Standard models can handle up to 400 separate points, but are easily expanded from any fewer number of points originally installed.

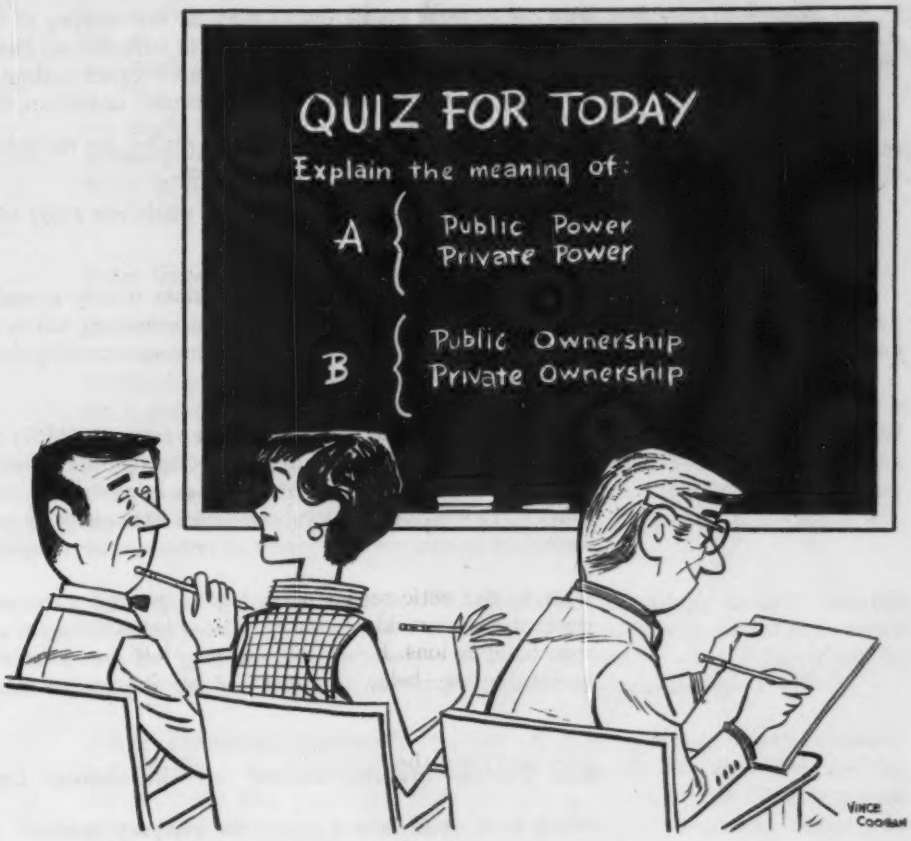
Detailed information on MOR is provided in Catalog 30A1400, available on request. But to really appreciate the advantages of MOR, see it in operation. We'll be happy to arrange a demonstration at your convenience. Fischer & Porter Company, 5580 County Line Road, Warminster, Pennsylvania.

FP FISCHER & PORTER COMPANY

COMPLETE PROCESS INSTRUMENTATION

These MANUFACTURING AFFILIATES carry Fischer & Porter engineering designs to the far corners of the earth: FISCHER & PORTER LTD., WORKINGTON, CUMBERLAND, ENGLAND • FISCHER & PORTER G.m.b.H., GROSS-ELLERSHAUSEN, BEI GOTTINGEN, GERMANY • FISCHER & PORTER N. V., KOMEETWEG 11, THE HAGUE, NETHERLANDS • FISCHER & PORTER Pty. LTD., 1457 MALVERN ROAD, TOORONGA, S.E. 6, VICTORIA, AUSTRALIA

These questions stump two out of three power customers . . .



Survey Probes Industry's Image, Semantics

A fascinating study of the industry's image, and some of the language it has been using to help build it, has just been completed by the Electric Companies Public Information Program (PIP). Just released, it shows clearly that some of the language the industry has been using for years to advance the cause of free enterprise either **(1)** Has little or no meaning to the public, or **(2)** Has a meaning that the industry never intended.

And the study showed (as long believed) that local power companies have a more favorable image in their own customer's eyes than does the power industry as a whole. Except, that is, in one critical area—that of planning and research for the future. Here, the industry outranked the local companies. But even the industry-wide image turned out distressingly poor on this count.

The PIP study, actually two surveys in one, was conducted by Central Surveys, Inc. It consisted of depth interviews with customers of 56 power companies at 67 different locations in 33 states. In all, 1,200 separate interviews were recorded in a sample taken to represent a realistic cross section by geographic area, size of company, and size of community. The final report was summarized by Jack

K. Busby, chairman of PIP Steering Committee (and president of Pennsylvania Power & Light Co), in an August 12 memorandum to electric company chief executives. Here are its conclusions and recommendations:

The Language Problem

Two out of three people cannot pinpoint the meaning of "public" and "private" power, the study revealed. One person in three had no idea at all of the meaning of these terms. And another third had an incorrect understanding of them. Here, for example, are the most common incorrect definitions those interviewed gave:

- "Public means shares are put on the market for the public to buy and private is owned by a small group or one person."
- "Public is something the public as a whole can enjoy while private is enjoyed by a few individuals."

People who gave such incorrect definitions usually consider these terms in the *generic* sense—they feel "private" means something that is restricted to a favored few, while "public," generally speaking, means something available to all and hence has a *favorable* connotation.

Furthermore, less than half of all power customers (48%) correctly identified the power company that served them as being "private ownership." Another 40% described their local power companies as being "public ownership," while 12% didn't know whether their local companies were public or private. *All those interviewed, of course, were customers of private power companies.*

What to do? "Since these terms (public/private) communicate so poorly," the report states, "their use should be avoided unless there are special reasons and full opportunity to explain their true meaning; and even in such cases, they should be preceded by the phrase 'so called' and put in quotation marks."

Best Choice—'Investor-Owned' or 'Shareholder Company'

Which term, then, best describes the company systems? The words "investor-owned" and "shareholder company" were found to be nearly equal in describing the private companies, and ranked highest of all terms tested before the public. These terms were meaningful to three out of four persons interviewed.

The term "taxpaying" ranked below investor-owned and shareholder company. But "taxpaying" at least was successful in differentiating between the private companies and the co-ops—something the first-choice terms did not do as well. The word "taxpaying," thus, is useful in some contexts.

"Business managed" ranked far below all these terms; it was meaningful to only one person in two and is often applied to municipals and co-ops as well as to the private companies. Thus, "business managed" has only slight value.

A substantial number of customers rejected the terms "private company" and "private enterprise" *as not fitting their power companies.*

Clearly, "investor-owned" and "shareholder company" are the preferable terms. "Investor-owned" has the additional advantage of being in general use, while "shareholder company" has a slight disadvantage—it is often applied to co-ops. Both terms, however, have a favorable (or at worst, neutral) connotation. But neither of these terms, the report cautions, should be permitted to obscure the fact that *a company's primary purpose is to serve its customers.*

The high-ranking terms may be effectively combined and varied, the report notes. For example, the words, "a taxpaying, investor-owned company with 200,000 customers and 25,000 shareholders in the Big Valley Region," could be used.

Which term best describes federal power? "Federalized electric power" ranked highest, by far, in the study. The word "nationalized" is somewhat less meaningful —less than one-half of those interviewed knew its meaning. The word "socialized" was not well understood. When talking about state and local projects as well as those of the federal government, the term "government-owned-electric-power" is useful; it is self explanatory and was found to be understood by all but a few people.

No single term, however, was discovered that would cover all forms of non-investor-owned power. REA co-ops, for example, must be labeled as such. There is no "government" word that includes them.

How Good an Image for the Power Companies?

On two counts, local companies had a more favorable image in the eyes of their customers than did the industry as a whole. These areas were: **(1)** The customer relationship (Is the company dependable? . . . Does it supply adequate power? . . . etc.), and **(2)** Civic or community relationship (Is the company a good place to work? . . . Is it civic-minded? . . . etc.). But the industry as a whole, not the local companies, enjoyed a better image in a third and critical area—that of planning and doing research for the future. And although the industry rated significantly higher than the local companies, even the industry was found to rate distressingly low. Here are the conclusions from the image study:

• **The facts about government in the power business** simply haven't been put across to the public. Some 43% of all power customers still are not even aware that the government is generating and selling electricity—a fact borne out by earlier PIP and Electric Companies Advertising Program studies as well.

• **It is encouraging, however, that the majority** of those who *do* know government is in the power business also know, **(1)** That government power projects are *tax-supported,* **(2)** That government power projects *pay no taxes,* and **(3)** That private power companies *do pay taxes.* This shows the industry is making headway in getting the facts about taxes across to the public.

The report recommends, (1) that the industry, as well as individual companies, step up efforts to inform people that government is in the power business, and **(2)** That the facts about taxes continue to get *heavy* emphasis.

Regardless of their extensive planning efforts, the utilities were found to have a lackluster image in planning for the future. Only about one-half of the companies' own customers are certain they can rely on the private companies to supply all the power that's needed in the future—without government help. Some 29% of those interviewed thought the government would have to step in and help the companies in supplying adequate power for the future. And another 19% had no idea whether government aid would be needed or not.

Customers Just Don't Know the Facts

Why do so many customers lack confidence in the industry's ability to supply future power needs? Mostly, it is because of sheer lack of knowledge of, and faith in, company abilities. Nearly one-third of the industry's customers believe the job of supplying future power will simply be too big, and too costly, for the companies to handle by themselves.

This lack of knowledge of what the companies are actually doing, and have been doing, is clearly reflected in these facts borne out by the study: **(1)** About half of the industry's customers equate atomic power development *only* with the government. **(2)** Nearly two-thirds of the industry's customers associate hydroelectric dams *only* with the government. People simply do not regard the power industry as being scientific-minded. Only 23% described their company as "research minded" (but the figure for the industry as a whole was higher—40%). And still fewer customers, 19%, described their company as being "scientific" (again, the industry as a whole came out ahead—25% said the industry was "scientific").

Rx for the 'Forward Look'

The local companies and the industry just don't have the "forward look," the report notes, although they are considered stable and dependable. The "forward look" is a critical vacuum that needs filling with facts. The following steps are recommended:

• **Company accomplishments, and those of the industry,** should be brought before the public at every opportunity and at all levels—national, state, and local. And the industry should not only stress accomplishments, but plans and intentions for the future as well. This means the industry should emphasize its work in all areas—including electrical living and farming, and especially nuclear and hydro power. The "forward look" should be put into every form of communication.

• **A bigger and more vigorous effort** must be made to tell the story of research and development.

• **Companies should emphasize the fact that power is being supplied** to customers across the nation by *many* independent companies. Most customers strongly favor, this idea, but few know it to be a fact.

• **The misinformed notion that future power supply is too big,** or too expensive, a job for the industry can be counteracted by, **(1)** Informing people of the magnitude of industry and company achievements, and **(2)** By explaining how companies cooperate on large projects, such as power pooling, construction of major transmission lines, and nuclear power.

Incidentally, earlier surveys have shown that people have scant knowledge of company paticipation in joint projects. PIP's nine-region survey in 1958, for example, indicated only one person in twenty could name even *one* electric company that was active in nuclear power development, in spite of the large number of companies involved in single and joint projects.

Other points stand out in the image study, although less strongly than those already mentioned, the report comments. One is that industry contributions to the community, both as a citizen and employer, are not rated as highly as they deserve. The survey suggests that each company should take a thoughtful look at its own activities in the community, and at its community policies, and then determine just how much recognition these activities are getting in the community.

Most of the report's recommendations involve telling a positive, affirmative story about the electric utility industry—the kind of story that is of highest interest to the public. The public is interested in the *future,* not in the past, the report notes.

To a large extent, people judge the industry on the basis of their judgment of their own company. Thus, if the industry's message is to be effective, it must be closely coordinated on both the local and national levels.

All-Electric Hospital Is Comfort Conditioned

One of the prime concerns in a hospital is patient comfort. The all-electric hospital may go a long way toward solving operating problems.

Opened last fall, the 40-bed Pleasant Valley Hospital in Point Pleasant, W. Va., represents a happy union of economy and efficiency. Fifty-six 1½-ton and two 3-ton heat pumps provide year-round heating and cooling comfort, safety, and health.

Total load for the hospital is 447 kw.

Part of this is taken up by water heaters, an all-electric kitchen, and assorted laboratory devices. Electricity also provides the steam for two large sterilizers in the maternity and operating suites, and for autoclaves located at various points in the building.

Through July, the average monthly kwhr consumption was nearly 70,000.

In the all-electric kitchen there are two ranges, a heavy duty and a special diet range, baking and roasting ovens, pressure cookers, deep-fat fryers and a broiler. Smaller equipment includes griddles, toasters, hot food tables, and an automatic coffee brewer.

Another piece of electric equipment for patient comfort is an electric food cart on which loaded food trays are taken from the kitchen to distribution points in the hospital corridors. In the course of meal servings, the trays are kept warm as the cart is plugged into wall receptacles.

The concept of a total-electric hospital grew slowly, however. At the first announcement of construction plans, Appalachian Power Co commercial representatives contacted the architect, Harry Ray Nay, to talk about electric heat and heat pumps.

Nay's problem was a familiar one: Getting the most building for the least money.

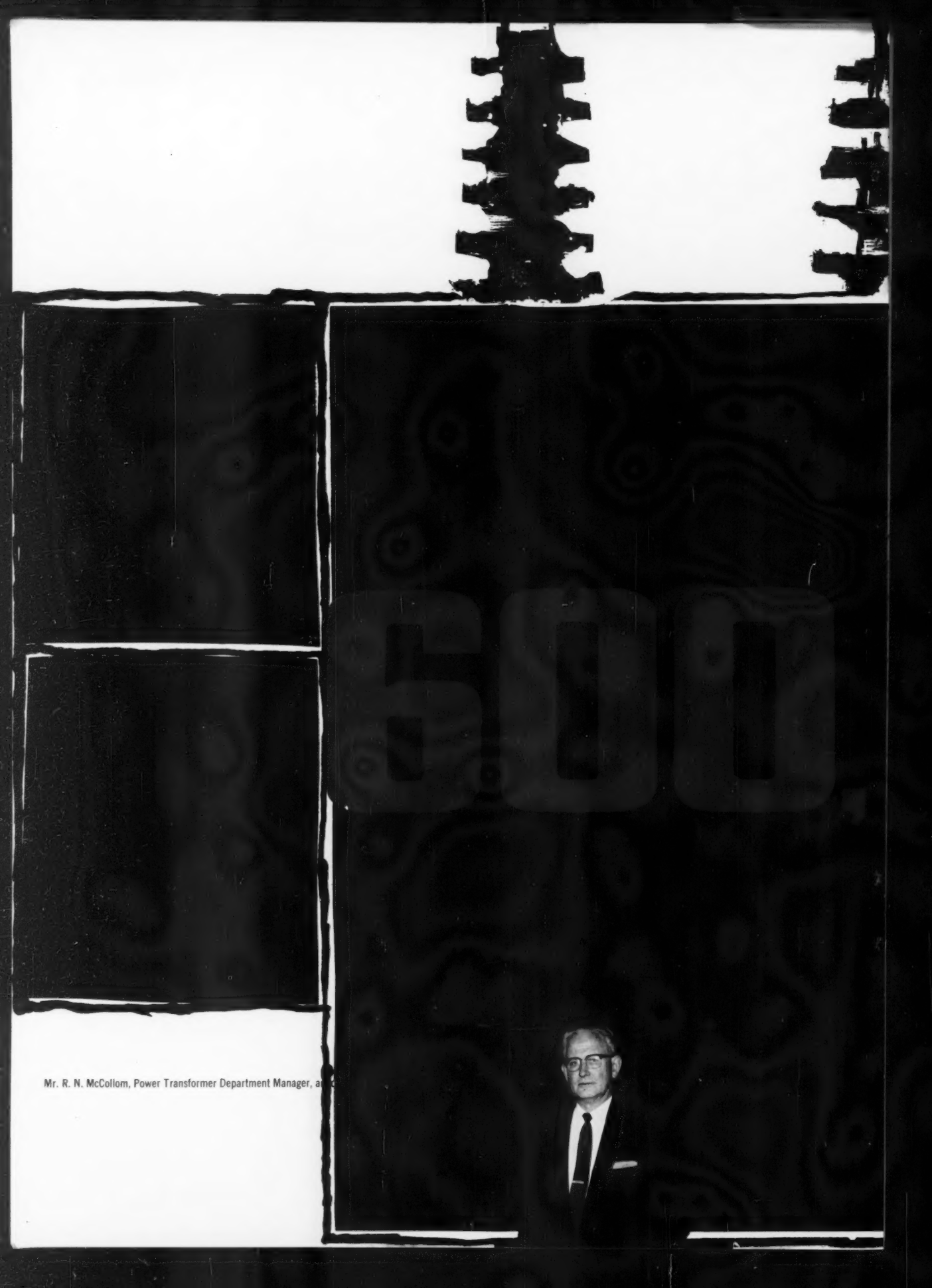
The hospital board had already agreed on the size of the building. Funds were available, having been collected through a local drive and the Hill-Burton Act. But in order to use government funds, the hospital had to meet certain conditions of humidity, temperature control, and air circulation.

Various methods were investigated. Appalachian Power proposed 56 individual 1½-ton heat pumps throughout the building, pointing out that each unit carried its own temperature controls for a specified area. Each patient's room would be equipped with a unit, permitting finger-tip temperature control by doctors and nurses for patient comfort.

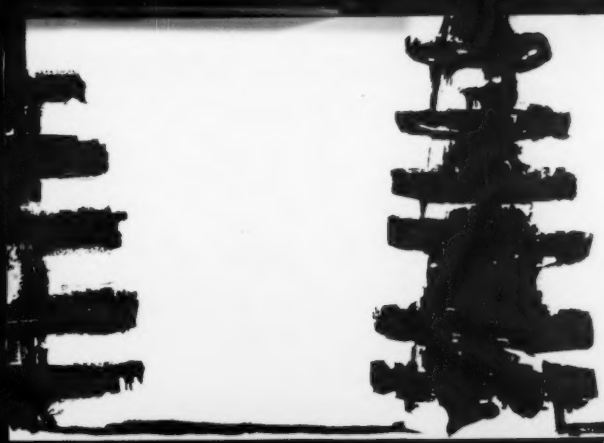
Nay then designed a heat pump into the operating and maternity suites. Here, however, he ran into difficulty. The Hill-Burton Act spells out specific requirements for heating, cooling, humidity and ventilation air in such areas. The nor-

(*Continued on page* 154)

ALL-ELECTRIC KITCHEN is important part of all-electric hospital; it speeds up hospital operation and helps provide for patient comfort



Mr. R. N. McCollom, Power Transformer Department Manager, a



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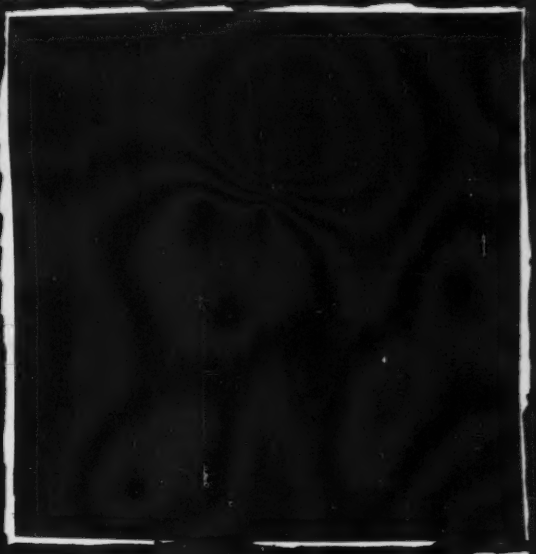


Westinghouse packs unprecedented 600,000 kva into world's highest capacity transformer

For: Commonwealth Edison Co., Chicago;
Will County Station; in service 1962
Capacity: 600,000 kva, 138 kv
Type: 3-phase generator transformer
Shipping: One piece, on Schnabel car
Largest transformer on the lines today: 400,000 kva . . .
also by Westinghouse
You can be sure . . . if it's Westinghouse

Westinghouse

JI-70949

All-Electric Hospital Is Comfort Conditioned (*Continued from page* 151)

mal heat pump did not meet these specifications. One manufacturer agreed to make certain modifications in its 3-ton package unit. In operation each of the two units now filter, warm or cool, humidify or dehumidify, and circulate the air through the suite at once. This cuts down the risk of contamination and cross-infection and makes operating conditions far more pleasant for doctors, nurses and patients. As a further comfort resistance heating has been installed in the ducts.

In a total-electric hospital, comfort and safety go hand-in-hand. Static electricity in an operating room can be a source of danger, so two electrical gadgets were installed. The first, just outside the operating suite doors, is a shoe tester to make sure that shoes are conductive. The second is an alarm system that automatically signals an improperly grounded piece of equipment or a faulty circuit.

Still not a year old, the hospital has already attracted the attention of hospital-building groups from two nearby counties by its low maintenance costs, high degree of cleanliness, and patient comfort.

Administrator George Smith, commenting on the single source of energy concept in the hospital, said, "Because of the elimination of the central heating system throughout the hospital, there is a constant flow of ideas in equipment and procedure that save time for personnel and make possible lower patient costs."

Cooled Cars Sell Faster Than Homes

Cooling of homes and commercial establishments is going to have to be stepped up if they are going to keep pace with a relative newcomer to personal comfort—automobile air conditioning.

Joseph B. Elliott, president of the York Division, Borg-Warner Corp, told a management institute of the National Appliance and Radio-TV Dealers Assn that an estimated 750,000 cars were air conditioned this year, compared to 3,000 in 1950. "Half of all new cars will roll off the assembly lines five years from now equipped with air conditioning," he said.

Elliott pointed out that only about 8% of the homes in this country are now air conditioned. He said that unless something is done to sell the public on the benefits of air conditioning in homes, "only 20% of this vast potential market will have air conditioning by 1975."

If air conditioning manufacturers and dealers learn how to market their product as successfully as other segments of the appliance industry, Elliot predicted, "Within a few years it won't be at all unusual to have a large part of our population leave their air-conditioned homes in an air-conditioned automobile; catch an air-conditioned train or bus to an air-conditioned office; lunch in an air-conditioned restaurant and visit an air-conditioned factory before starting the trip home."

Youngsters will attend air-conditioned schools and the woman of the house will visit the shopping center moving from store to store, all air conditioned, on an air-conditioned sidewalk. "Properly covered, an air-conditioned city is within easy reach of our present technology," Elliott commented.

He indicated that there would be a continual development of existing types of air conditioning, rather than a sudden revolution of new types, and that there would be further advances in gas-powered air conditioning.

Elliott told the appliance dealers that air conditioning would achieve its sales potential only after it was made sufficiently desirable and the benefits were sold to every member of the family—"benefits of health and comfort, of restful sleep and well-balanced meals all year round, of children napping and calm nerves, of gracious entertaining and clean home and longer-lasting drape and upholstery."

WWP Plans Electric Heat Campaign

Washington Water Power Co now has 15,000 electric heat customers in its two-state (eastern Washington-northern Idaho) service area. This includes 4,000 in the Spokane area.

The Inland Empire Electric League and its dealer members throughout the WWP territory are getting ready to launch another fall promotion on electric heating September 1. to November 15.

League officials said that a recent local survey showed that more than 2,000 home owners plan to switch to electric heat within the next two years.

SELLING BRIEFS

All-electric **apartment house,** reportedly the largest of its kind in the country, is under construction in Los Angeles. Apartments will be equipped with electric heating, air conditioning, kitchen and laundry appliances, and special lighting.

Holiday **recipe book** contains contributions from many countries overseas and home service directors of US utility home service directors and Rural Electrification Association home economists. With every 1,000 copies of the recipe book goes a free copy of "Modern Kitchens Of Europe" Two-page center spread is devoted to Christmas electric gift suggestions. Write: Wisconsin Advertising Service, 2333 W. Wells St, Milwaukee 3, Wisconsin.

Television set promotion is now planned for September by Northern California Electrical Bureau. The top feature will be a retail sales contest with 111 prizes, valued at $4,125. Grand prize: 7-day Waikiki Holiday. Pacific Gas & Electric Co has scheduled advertising support.

Blanchar Made President of PS of Indiana

Carroll H. Blanchar has been elected to succeed Edmond W. Hebel as president of Public Service Co of Indiana, Inc. Hebel has become vice chairman.

Blanchar also succeeded Ralph K. Clifford, retired, as a member of the board of directors.

A graduate of the University of Wisconsin and Harvard Graduate Business School, Blanchar is a certified public accountant.

Beginning his business career with Arthur Anderson & Co of Chicago, Blanchar held executive positions at Commonwealth Edison Co, United Airlines Corp, and Roddis Plywood Corp, Wis., before joining Public Service Co.

BLANCHAR HEBEL

Union Electric Names Gamble, Schettler Executive VPs

GAMBLE SCHETTLER

George P. Gamble and A. H. Schettler have become executive vice presidents of Union Electric Co. R. D. White was named comptroller.

Dudley Sanford, executive vice president since 1954, will retire November 1.

Gamble, former vice president-operations, will be in charge of operations and will have executive responsibility for regional matters and labor relations.

Schettler, former vice president and comptroller, will control fiscal, commercial, employee relations and general administrative matters.

White was formerly assistant comptroller.

Stone & Webster Appoints Sperry, Hawkins VPs

Stone & Webster Service Corp has appointed Frank C. L. Sperry and Edgar M. Hawkins Jr vice presidents.

Sperry was also elected president of Conversions & Surveys, Inc, Service Corp subsidiary.

Sperry has been personnel director since 1957. He joined Stone & Webster in 1947 after having previously been associated with Blackstone Valley Gas & Electric Co, Atlanta Gas Light Co, and Peoples Gas Co.

Hawkins first joined Stone & Webster in 1933 after graduating from Massachusetts Institute of Technology. He served with Virginia Electric & Power Co and Michigan Gas Utilities Co, and returned to the Service Corp in 1959.

SPERRY HAWKINS

(*More News About People on page* 156)

Electrical World Makes Editorial Staff Changes

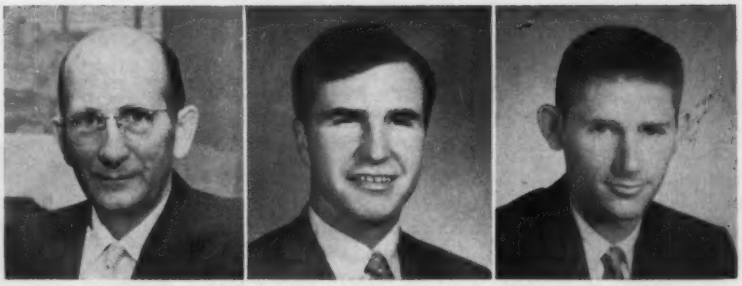
A re-alignment of editors has been made by *Electrical World*, effective September 1.

Edward Allen has been named southeastern editor. Francis J. Kovalcik replaces him as midwestern editor, and Willard L. Felsen will become northeastern editor.

Kenneth N. McLean, former northeastern editor, has moved to associate news editor.

Dale VanHorn will head up the news department, replacing Thomas R. Jordan who recently joined Bozell & Jacobs as an account executive and a member of the electric companies' Public Information Program.

A graduate of Louisiana State University, Allen has been midwestern editor of *Electrical World* since 1949. He began his career with the Chicago Central Station Institute in a training program for the Insull Companies. He then joined Public Service Co of Northern Illinois in transmission and distribution engineering and operating.



ALLEN KOVALCIK FELSEN

From 1937 to 1945 he was with *Electric Light & Power* magazine, his last position being editor. From 1945 to 1949 he was with the Electric Power Board of Chattanooga in general service engineering.

Kovalcik joined *Electrical World* in 1948 as an editorial assistant. In 1949 he was named assistant editor and became western editor in 1952. He returned to New York in 1957 as northeastern editor, and was named methods editor in 1959 where he was in charge of Electric Utility Methods.

Felsen joined the staff earlier this year. He was with Hawaiian Electric Co from 1954 to 1957 as substations designer.

Bauman Named Chief Executive Officer

J. N. Bauman has been named chief executive officer of the White Motor Co, a position held for the past 25 years by Robert F. Black.

Bauman joined White Motor in 1922 as an apprentice transportation engineer. After experience in engineering and production he moved to the Sales Division and became vice president in charge of sales in 1937. He was named executive vice president in 1955, and became president the following year.

PERSONAL BRIEFS

West Penn Power Co has named **A. T. Emmons** comptroller and **R. E. Caywood** assistant vice president.

Rochester Gas & Electric Co has promoted five: **Paul Briggs,** to secretary; **George Fiedler, Frederick Pfluke, Schuyler Baldwin,** and **Francis Drake,** to assistant vice presidents.

Potomac Edison Co has named **Richard H. Smith** residential representative in the Hagerstown, Hancock, and Berkeley Springs, Md., areas. He succeeds **Arthur E. Short,** who has transferred to the Waynesboro district.

Pacific Gas & Electric Co has made the following administrative changes in the East Bay Division's steam-electric generating complex: **Howard H. Jackson** has become division power generation manager; **N. E. Rhodes** has been promoted to division superintendent of power production; and **E. F. Kaprielian** has succeeded Rhodes as superintendent of San Francisco Division's steam plants.

Virginia Electric & Power Co has made the following appointments: **Stuart C. Will** to manager at Williamsburg, succeeding **L. L. Bond** who has become assistant director

(*Continued on page* 158)

cross-channel power link

The submarine power cable to be laid across the English Channel between Dungeness and Boulogne will be similar to the cable shown here. This cable, which now connects British Columbia with Vancouver Island, was manufactured and laid by BICC in unjointed 16-mile lengths.

The Central Electricity Generating Board and Electricité de France have placed contracts for the manufacture and laying of the cross-Channel submarine power link.

Two 100,000 volt single-core submarine power cables will put England and France on one electrical grid—a new balance of power to ease mutual problems of supply and demand.

With a capacity of 160 megawatts (over 200,000 h.p.) in either direction, this submarine circuit will carry the heaviest D.C. electrical load ever transmitted under water.

Cables for the British section will be made by two famous companies—BICC and AEI—working in close collaboration.

BICC

submarine **power cables**

2164

BRITISH INSULATED CALLENDER'S CABLES LIMITED 21 BLOOMSBURY STREET LONDON WC1 ENGLAND

of Vepco area development department's industrial section; **William L. Maner Jr** has been made supervisor of employee training and information, succeeding **C. T. Lucy,** new manager at Crewe; and **Peter R. Beament,** engineering assistant at Vepco's Chesterfield Power Station, has been assigned to Carolinas-Virginia Nuclear Power Associates.

New assistant vice presidents at South Carolina Electric & Gas Co are **Frank C. Davis** and **R. Hunter Kennedy.**

Winnett Boyd has been elected president of the recently-established Arthur D. Little, Inc, subsidiary, Arthur D. Little of Canada, Ltd. His headquarters are at 30 Memorial Drive, Cambridge, Mass.

Henry F. Naybert, secretary and general auditor of Northern States Power Co of Wisconsin, has become chairman of the Wisconsin Utilities Assn's accounting section. **Robert C. Horn,** Wisconsin Public Service Corp, succeeds Naybert as vice chairman of the section.

H. L. Ledermann has been appointed assistant manager-product advertising, The Okonite Co.

Walter P. Matzelevich has been appointed manager of Line Material Industries' Kyle Products plant at South Milwaukee, Wis. **Jack L. Nickerson** has assumed field engineering duties in the Revere, Mass., area; **R. G. Peck** is a field engineer serving customers in the Charlotte, N. C., area; **J. E. Winderweedle** has assumed the field engineering duties of **Brady Stoughton** who has moved to Tampa, Fla., as district manager; **Bill Sorrell** has been assigned to a field engineering territory with headquarters in Pensacola, Fla., and **Dennis Wilson** is field engineer serving customers in the Butte, Mont., area. **B. I. Fansler,** lighting engineer, has transferred to New York City, with offices in Union, N. J.; **Flynn Chamblee** has been named lighting engineer for the southwest region serving customers in Texas, Oklahoma, and New Mexico, out of Dallas; **Dick Greener** has been transferred to Boston as field engineer; and **Earl Stites** has been appointed apparatus engineer with headquarters in Los Angeles.

C. A. Liming has been promoted to marketing manager-power capacitors for Federal Pacific Electric Co.

Worthington Corp has named **C. Freeman** as manager, advertising and sales promotion; **Joseph F. Sebald,** chief engineer of the steam power section, has been selected as an author in the McGraw-Hill Encyclopedia of Science and Technology.

Moloney Electric Co has appointed **Kenneth G. Mayhan** assistant supervisor of the research and development laboratory.

M. E. Ziegenhagen has been appointed director of advertising and public relations of Babcock & Wilcox Co.

The following have been named members of the program for public utility companies of the New York Society of Security Analysts: **A. D. Stearns,** The Hanover Bank, chairman; **Albert C. Barkwill,** The Lehman Corp; **Paul Hallingby Jr,** White Weld & Co, **Quentin C. Johnston,** The Bank of New York; and **William H. Reaves,** Kidder, Peabody & Co.

I. W. Borda, vice president and general sales manager, The Okonite Co has retired, as has **George B. Brown,** vice president of the Joslyn Mfg & Supply Co.

Raymond Martin has been named chief engineer, distribution and transmission hardware of the A. B. Chance Co.

Ralph D. Evans has been appointed midwestern sales manager of the Sun Switch Division-Ripley Co.

C. Reed Cary, chairman of the board, Leeds & Northrup Co, has retired, but will continue to serve on the board . . . **L. W. Taylor,** general power apparatus and outside construction sales manager of Graybar Electric Co, has retired.

MARX

Erratum

In the August 22 issue of Electrical World, the stories on the promotions of W. N. Marx, Nothern States Power Co of Wisconsin, and Oakley N. Dean, Exide Industrial Division, Electric Storage Battery Co, were reversed.

Marx is the new vice president in charge of operations for NSP of Wisconsin, and Dean is the new vice president-manufacturing for Exide.

Electrical World regrets the error.

DEAN

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Dispute Blocks 975-Mw African Hydro Project

A dispute over power rates has snagged international negotiations on a multi-million-dollar hydro and aluminum project on the Volta River in Ghana.

Involved in the dispute is a private consortium, headed by Kaiser Industries Corp; the Ghanaian government; the International Bank for Reconstruction and Development (World Bank); and the US and British governments.

The private consortium, which is reported to include Reynolds Metals Co, Olin Mattieson Chemical Corp, and Aluminum Co of Canada, as well as Kaiser, plans to build three dams totalling 975 Mw, for an estimated $300 million. It will then use the power to smelt Ghanaian bauxite into finished aluminum for the European market.

Kaiser officials said the kw-cost would run between six and seven mills. The power was to be financed with public money, with Ghana putting up almost $80 million for the first dam at Kosombo. The rest would come from the World Bank, with the US and British governments adding smaller sums. The plan was for the Ghanaian government to sell power to the private aluminum companies at a special rate, between 2.0 and 2.5 mills.

The trouble began when the World Bank, after a survey completed this summer, urged that the charge be at least 2.5 and preferably 3.5 mills to make the project sound economically. The Bank argued that the Ghanaian government would have to charge at least 3.0 mills in order to pay its 5.75% bank loan.

Ghanaian Prime Minister Nkrumah then asked the consortium to pay 4.5 mills and the private interests exploded. Overnight Nkrumah dropped his rate to 3.5 mills but the consortium continued to balk.

Russian Aid Hinted

Nkrumah asked the US to straighten out the talks, hinting that he would have to turn "elsewhere" to get the dam financed if the deal fell through. Moscow had already offered help.

Nkrumah reportedly feels that the consortium is trying to get the cheapest possible power rate at Ghana's expense. Consortium members are said to feel the World Bank "sold out" private interests by suggesting a higher rate. The World Bank report is said to have been leaked to the consortium, after Nkrumah refused to release it, by an Italian construction company who hopes to help build the dam.

US officials are trying to find some public money that can be loaned to Ghana at cheaper rates over a longer period than World Bank funds so Ghana can offer the consortium cheaper rates. This will involve either the US Export-Import Bank or the State Department's Development Loan Fund. However, Export-Import loans are tied to purchase of US equipment.

With some low interest money coming from Britain, Ghana asked the World Bank to put up only $45 million and the Development Loan Fund another $30 million at 30-year, 3.5% interest, not restricted to US purchases.

Although the State Department announced recently that it would loan the $30 million, decision has yet to be made whether the whole will be taken from the DLF or whether the Export-Import Bank may participate. Thus the US loan may still not enable Ghana to offer the consortium lower power rates. Compromises of some sort could reduce the power rate to between 2.5 and 2.75 mills, which consortium spokesmen may accept.

First High Density BWR Underway

First high density boiling water reactor, being built by Consumers Power Co, is now under construction near Petoskey, Mich. Scheduled to be completed in the fall of 1962, the plant will have an initial nominal capacity of 50 Mw. Maximum expected gross capacity is 75 Mw.

The reactor will have an initial rating of 607,000 lb of saturated steam per hr at a pressure of 1,020 psi. A joint development program by Consumers Power, the Atomic Energy Commission, and General Electric Co is expected to boost this to 964,000 lb at 1,470 psi. Illustration shows the crater for the reactor vessel.

Total cost of the project is estimated at $27,762,000.

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The Meetings Calendar

SEPTEMBER

Edison Electric Institute—Street and Highway Lighting Committee, Salem, Sept. 7-8; Residential Lighting Promotion Committee, Cleveland, Sept. 12-13; EEI-AGA Accounting Division & Section Organization Meetings, The Pittsburgh Hilton, Pittsburgh, Sept. 15-16; Meter & Service Committee, Westchester Country Club, Rye, N. Y., Sept. 18-21; Residential Electric Heating & Air Conditioning Committee, New York City, Sept. 19-20; Commercial Electric Space Heating & Air Conditioning Committee, Columbus, Sept. 20-21; Industrial Power & Heating Group, Milwaukee, Sept. 21-23; Residential Wiring Promotion Committee, Salem, Mass., Sept. 22-23; Farm Group Meeting, New York City, Sept. 26-27; Commercial Lighting Committee, Birmingham, Sept. 26-27; Residential Appliance Promotion Committee, New York City, Sept. 26-27; Industrial Relations Committee, 13th Annual Round Table Conference, Drake Hotel, Chicago, Sept. 26-28; Market Research Committee, Detroit, Sept. 27-28; Home Service Committee, Fort Worth, Sept. 29-30; Commercial Cooking Committee, Akron, Sept. 29-30.

Association of Illinois Electric Cooperatives—Annual Meeting, St. Nicholas Hotel, Springfield, Sept. 7-9.

Northwest Electric Light & Power Association—53rd Annual Meeting, Glacier Park Lodge, Glacier, Mont., Sept. 7-9.

Joint Automatic Control Conference—Sponsored by ISA, ASME, AIEE, IRE, AIChE, Massachusetts Institute of Technology, Cambridge, Mass., Sept. 7-9.

Rocky Mountain Electrical League—Annual Fall Conference, Hilton Hotel, Denver, Sept. 7-10.

• **Columbia Utilities Association**—Maryland District, Annual Fall Conference, Cavalier Club, Virginia Beach, Sept. 9-10.

American Society of Mechanical Engineers—International Air Pollution Congress, Statler-Hilton Hotel, New York City, Sept. 10-11.

Electrical Living Show—New York Coliseum, New York City, Sept. 10-18.

Illuminating Engineering Society — 1960 National Technical Conference, Penn Sheraton Hotel, Pittsburgh, Sept. 11-16.

Northwest Public Power Association—Accounting Section, Annual Meeting, Wenatchee, Wash., Sept. 14-15; Power Use Section, Annual Meeting, Hotel Monticello, Longview, Wash., Sept. 29-30.

Public Utilities Advertising Association—Region 5, Annual Meeting, Tampa Terrace Hotel, Tampa, Sept. 15-16.

Public Utilities Association of the Virginias—Executive Committee, White Sulphur Springs, W. Va., Sept. 15; 42nd Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 15-17.

Municipal Electric Utilities Association of New York State—30th Annual Conference, Lake Placid Club, Sept. 15-17.

• **Indiana Electric Association**—Annual Convention, French Lick-Sheraton Hotel, French-Lick, Ind., Sept. 28-30.

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